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THE
JOURNAL OF APPLIED PSYCHOLOGY

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A MASS MENTAL TEST FOR USE WITH KINDERGARTEN AND FIRST GRADE CHILDREN

By CLARA HARRISON TOWN, Ph. D.,

Every year finds a greater number of public schools attempting to classify their pupils according to mental ability, and to measure their mental ability by means of mental tests. As an adequate individual mental examination of all children in a large school system is impossible without a large force of mental examiners the mass test has come into quite general use.

There are a number of mass tests adapted for use with children of the third and more advanced grades, but it has been found difficult to devise tests that can be used successfully with groups of kindergarten and first grade children. As the early grades are those in which mental classification is most urgently needed, it is much to be desired that if mass testing in these grades is possible, a satisfactory test be devised.

During the winter of 1919-20 the writer was confronted with the problem of picking out the atypical children in certain kindergarten and first grades in the schools of Kansas City, Missouri, for the purpose of placing them in classes for individual training. Desiring to use for this purpose a mass test an attempt was made to devise one which would bring into play mental activities which Binet found developed in young school children, and which would accomplish this without requiring a verbal or written response from the child.

The writer fully realized the difficulties involved in testing young children in groups, realized the flightiness of attention which renders concerted group work almost impossible, the strong individualistic tendencies, which disappear after several years of class room experience, but which at this period often lead a child to a response quite other than that indicated, the tendency to look to see how others are responding rather than

to depend upon self, which may entirely defeat the purpose of the test, and the short fatigue period, which makes maximum effort throughout a long test series impossible. In spite of this keen realization of the innate difficulties of the situation which made the achievement of a satisfactory test most problematic, the writer thought the demand for such a test justified the expenditure of much time and thought in an effort to devise it.

Bearing in mind the difficult factors in the practical situation, an effort was made to (1) secure test material which would immediately arouse interest and pleasure, (2) avoid confusion of impression by presenting each problem in isolation and (3) guard against wandering of the attention by using a series of tests each of which is quickly solvable and through which the examiner may personally lead the class without delay. It was decided to adapt, wherever possible, the material of the Binet-Simon Intelligence Scale to mass methods. As verbal and written responses were both ruled out, the first by the mass nature of the test and the second by the inability of the children to write, the "cross out" method, so successfully used by Dr. Pressey and others, was linked with the Binet problems and a "Picture Game" evolved.

The "Picture Game" consists of a sixteen page picture book, five inches by seven inches, which is here reproduced. Almost all children love pictures and when one proposes a game to a class and distributes little books full of pictures with which to play it, there is usually a glad and happy response,—interest and pleasure are at once aroused. The success of the test depends largely upon whether this pleasurable interest can be sustained throughout the performance. This the writer tried to insure by a series of short and varied tests which a class can be put through in from ten to fifteen minutes.

The game consists of thirteen tests and an initial page used for teaching what "cross out" means. Tests 1, 2, 3, 4, 5, 6, 7, 9, 11, 12, and 13, in order of presentation in book are adaptations of tests 30, 7, 13, 15, 12, 19, 24, 25, 33, 17, and 23 of the Binet-Simon Intelligence Scale, 1911 Revision (Town translation). These tests in order of presentation are: color naming; pointing out of eyes, nose and mouth; pointing out of objects named; discrimination of length; discrimination of sex; counting four objects; counting thirteen objects; aesthetic judgment; completion test; copying of square; copying of diamond. Two additional tests are included in series—number eight, a form test, and number ten, a completion test. Both of these are based upon well known tests.

In each of the cross out tests, and all are cross out tests with the exception of the drawing of the square and the diamond, three chances are given child to demonstrate ability to deal with the problem. For each test three pictures are presented on one page, but distinctly separated, in all of which the fundamental problem involved in the cross out is identical. If the child succeeds in crossing out two correctly it is assumed that he understands the problem and full credit for test is awarded. Exceptions to this rule are made in the color naming test and in the aesthetic judgment test, in both of which a perfect performance is required. This variation is necessary in the aesthetic judgment test because it is impossible to arrange the three pairs of pictures in such a way that two ugly ones will not be in line with each other, and a child might make two successes by the simple procedure of marking all the pictures on the right or left of the page. The color test also gives much opportunity for chance successes and it was therefore thought better to require three correct cross outs.

Partial credits are used only for drawings of square and diamond. The individual differences in the drawings are so great that a credit of success or failure seems inadequate to meet the situation. The partial credits are based on examiners judgment of (1) general shape of drawing, (2) the accuracy of the angles. Only one attempt at each drawing is allowed.

The performance is scored by means of a point scale. The number of points assigned for each of the thirteen tests varies with (1) the difficulty of the test, (2) the mental age at which ability to perform the test is usually developed. The degree of difficulty was experimentally determined by trying out the tests on 419 kindergarten children and 778 first grade children in several of the schools of Kansas City, Missouri. The number of children failing in each test was recorded and the tests then arranged in rank order determined by the number of children failing in each. The mental age was assumed to be that determined by Binet for the performance of similar tests in the Intelligence Scale. Tests number eight and ten, having no equivalent in the Binet series, were scored entirely on a basis of rank order.

The lowest score assigned to any test is six, this is given to tests placed at the four year level by Binet and the other tests are scored on the principle of one additional point for each additional year of assigned mental level. The rank order of difficulty made it necessary to score the aesthetic judgment test one point lower, and diamond drawing one point higher

than the Binet age ranking would indicate. These are the only conflicts between Binet ranking and our attained rank order of difficulty in spite of the fact that mass instead of individual methods were used. In scoring drawing of square, four is given for shape and three for four correct angles. In scoring drawing of diamond, five is given for shape and four for four correct angles.

The rank order (based on number of failures in each) of the thirteen tests, with scores assigned to each is as follows. The tests are numbered according to their order of presentation in the book, which was determined partially by their supposed difficulty, partially by the desire to have the blank pages for drawings at the end of book and test series, and partially for the printer's convenience in arranging the color pages. It is probably of some practical advantage in giving the tests to have the more difficult ones distributed through the series rather than grouped.

Order of difficulty	Test No.	Test Score	Page
1	4	6	6
2	3	6	5
3	2	6	4
4	5	6	7
5	12	7	15
6	9	7	11
7	6	7	8
8	7	8	9
9	10	9	12
10	1	9	2, 3, 14
11	13	9	16
12	11	10	13
13	8	10	10

Procedure

As indicated by the name of the test series " Picture Game," this series is a game and should be conducted in the spirit of one. No notion of a test should be allowed to enter the children's minds. The children should be seated at as great distances from one another as possible in order to prevent copying. This is particularly necessary with kindergarten children. Not more than twenty kindergarten children should be handled in one group. The tops of desks should be cleared and each child provided with a black crayola.

When all is ready the examiner asks the children whether they would like to play a game, and when they assent she tells them that each will have a little picture book to play

it with. She then distributes the books telling the children to place them on their desks so that the rabbit is looking at them, and to leave them on their desks during the whole game. All is then ready and the examiner proceeds as follows: "Do you see the rabbit? Do you see the rat? Cross out the rabbit. When I say 'cross out' I mean, put a line through it like this." Demonstrate on blackboard and on sample book which you hold up before the class. After rabbit has been crossed out say, "Do you see the duck? Do you see the picture of the book? Cross out the picture of the book." This first page of the book is not a test but is used for instruction in crossing out. The test series is not begun until the examiner is assured by actual inspection of each child's book that all the children know what is meant by "cross out." This is the only bit of knowledge which is required for the manual execution of all the cross out tests. When it is determined that each child knows what is meant by "cross out" proceed as follows, allowing ample time for crossing out between each instruction: "This little book is full of pictures, and on each picture I am going to ask you to cross out something. You cross out just what I tell you to, and do not cross out anything else. Now we will begin. Are you all ready? Turn the page.

Test 1, page 2—"Cross out the red. Page 3—"On the next page cross out the blue. Turn the page.

Test 2, page 4—"See the pretty little girl at the top of the page? Cross out her nose.
See the little girl just below her? Cross out her eyes.
See the last little girl? Cross out her mouth.

Test 3, page 5—"At the top of the next page you will see a picture of a room. Do you see it? Cross out the bed.
Below that picture you will see another picture. Cross out the boat.
At the bottom of the page you will see another picture. Cross out the key. Turn the page.

Test 4, page 6—"There are two pencils at the top of this page. Everyone see them? Cross out the longer pencil, the longest pencil.
Below the pencil there are two rulers. Cross out the longer ruler, the longest ruler.
At the bottom of the page there are two knives. Cross out the longer knife, the longest knife.

Test 5, page 7—"At the top of the next page you see a little boy and a little girl. Cross out the boy.
In the next picture cross out the man.

In the next picture cross out the girl.
Turn the page.

Test 6, page 8—"At the top of the next page you will see some chains. Do you see the chains? Cross out the chain that has four links.
Below the chains there are some apples. Do you see the apples? Cross out the pile of four apples.
Below the apples there are some pears. Cross out the pile of four pears.

Test 7, page 9—"At the top of the next page you will see some acorns. Do you see them? Cross out the line of thirteen acorns.
In the next picture you see a lot of little ducks. Cross out the line of thirteen ducks.
Below the ducks there is a picture of blocks. Cross out the line of thirteen blocks.
Turn the page.

Test 8, page 10—"At the top of the page you see four blocks—a circle, a triangle, a cross, and a square. There are heavy lines under them and just below five blocks. Four of these are like the blocks at the top but there is one left over, which is not like any at the top of the page. Cross out this one that is left over, the one not like any block at the top of the page.
Below this picture is another picture of five blocks. Four of these are just like the four at the top of the page, and there is one left over.
Cross out the one that is left over.
At the bottom of the page there is another picture of five blocks, four of these are just like the four blocks at the top of the page, and there is one left over. Cross it out.

Test 9, page 11—"At the top of the next page you will see two ladies, a pretty lady and an ugly lady. Cross out the ugly lady.
In the next picture you see two horses. Cross out the ugly horse.
In the next picture you see two men. Cross out the ugly man.
Turn the page.

Test 10, page 12—"At the top of the next page there are pictures of three objects. Two of them are something alike and one is different. It is not like the other two. Cross it out.
Below this picture there is a picture of three people. Two of them are alike. The one is not like the other two. Cross it out.

At the bottom of the page you see the picture of three animals. Two of them are alike. One is not like the other two. Cross it out.

Test 11, page 13—"At the top of the next page there is a picture of a cow. Do you see it? When they drew that cow they did not quite finish her, they left something out. Put a mark where it should be.
Just below the cow there is a picture of a boy's head. When they drew that head they did not quite finish it, they left something out. Put a mark where it should be.
At the bottom of the page there is a picture of a house. When they drew that house they did not quite finish it, they left something out. Put a mark where it should be.
Turn the page.

Test 1, page 14—"Cross out the green.

Test 12, page 15—"You see the next page is an empty page. I am going to draw something on the blackboard, and I want you to draw it on this empty page, just as nicely as you know how." (Draw a square on blackboard.)
"Turn the page.

Test 13, page 16—"The next page is empty too. Now I am going to draw something else on the board, and I want you to draw it on this empty page just as nicely as you know how." (Draw diamond on board.)
"Turn your books over so that the rabbits will be looking at you again.
Write your name on the line marked name."
After name is written, say—"Now write how old you are."

If children have not learned to write, have teacher write names and ages.

Experimental Results

Twelve kindergarten classes, containing in all 419 children, (average age, 5.5) and twenty-two first grades, containing in all 778 children (average age 6.9) were tested by the writer. The number of individuals failing in each test was counted and recorded in terms of percentage of grade group. The average total score, with its mean variation and probable error, and the median, were computed for each separate class and each grade group. Finally the individual total scores of children in each grade group were thrown into percentile tables in order to show what scores the 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 percentiles of each grade group secured. All of these results are here presented in tabulated form.

A group of second grade classes were also examined, but the tests proved to be so far below the level of ability of the second grade children that it is not worth while to present the results.

The results here given confirm the impression gained by the writer in conducting the tests that the Picture Game is adapted to use with kindergarten and first grade children, and that by its use one can obtain a fairly good classification of children in these two lower grades.

PERCENTAGE OF CHILDREN FAILING IN EACH TEST

Rank order of test	Test No.	Kind. Child. failing—per cent	First Grade Child. failing—per cent
1	4	13	1
2	3	16	2.4
3	2	28	7.8
4	5	36	11
5	12	36	20
6	9	42	15
7	6	52	13
8	7	62	15
9	10	52	23
10	1	57	25
11	13	64	41
12	11	73	43
13	8	75	45

The rank of tests 4, 3, 2, and 5, the four lowest in rank and of tests 13, 11, and 8, the three highest in rank and of test 9 are identical in kindergarten and first grade groups. The differences of rank order are caused by tests 6 and 7, the two counting tests, and are probably due to the facts that count-

CLASS AND GROUP SCORES—KINDERGARTEN

Class	Numb. Child.	Ave. Age	Ave. Score	M. V.	P. E.	Median
1	41	5.6	54.2	22.9	19.35	62
2	15	5.9	62	18.1	15.29	65
3	47	5.1	41.7	16.5	13.94	42
4	30	5.7	38.5	20.2	17.07	45
5	37	5.7	37.5	19.5	16.48	38
6	16	5.6	41.4	14.9	12.59	34
7	58	5.1	47.3	17.4	14.70	44
8	39	5.6	36.9	21	17.75	34
9	34	5.9	51.7	22.2	18.76	56.5
10	44	5.4	56.9	20.8	17.58	58.5
11	45	5.2	56.4	18.6	15.72	58
12	13		42.1	17.7	14.96	44
Totals	419	60.8	566.6	229.8	194.19	581
Averages		5.5	47.2	19.1	16.18	48.4

ing is still a novel process for the kindergartners and has already become almost automatic with the first grade children. Test 12 is displaced in the first grade series by tests six and seven which take precedence. The adopted rank order was obtained by pooling the results obtained from kindergartens and first grades. This order is used in the above table.

PERCENTILE SCORES—KINDERGARTEN

Percentiles	Scores
100	100
90	81
30	70
70	62
60	54
50	47
40	41
30	33
20	24
10	12
00	00

CLASS AND GROUP SCORES—FIRST GRADE

Class	Numb. Child.	Ave. Age	Ave. Score	M. V.	P. E.	Median
1	18	6.9	81.5	9.5	8.03	83.5
2	38	6.3	66.8	17.6	14.87	69
3	40	7.7	70.5	14.9	12.59	75
4	22	8.2	83.8	8.9	7.52	85
5	33	7.2	73.9	12.9	10.90	79
6	32	7.2	57.9	14.5	12.25	56
7	44	7.7	79.8	9.7	8.19	80
8	40	6.6	63.7	13.7	11.58	64.5
9	41	6.9	61.2	11.3	9.55	64
10	23	7.4	88.9	7.2	6.08	90
11	39	6.5	82.1	10.6	8.96	84
12	42	6.3	73.8	14.2	12.00	77.5
13	41	6.6	78.1	14.6	12.34	82
14	42	6.6	78.1	13.8	11.66	82.5
15	28	7.3	72.7	13.5	11.41	79
16	38	8	75.1	12.9	10.90	75
17	39	6.5	76.1	14.7	12.42	80
18	45	7	84.3	11.3	9.55	90
19	40	7.1	81.6	12	10.14	84.5
20	24	6.5	75.2	12	10.14	77
21	36	7.4	72.8	15.5	13.10	81.5
22	33	6.2	59.7	15.3	12.93	65
Totals	778	154.1	1637.6	280.6	2371.1	1637.6
Averages		7	74.4	12.7	10.77	77.4

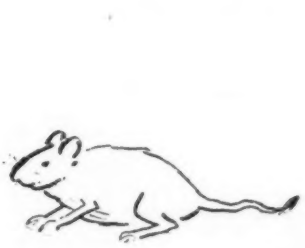
PERCENTILE SCORES—FIRST GRADE

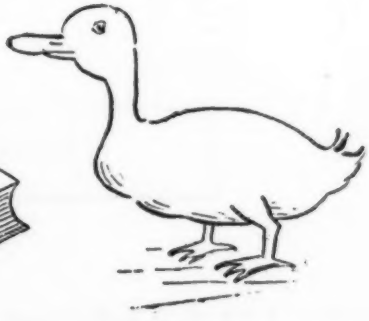
Percentiles	Scores
100	100
90	96
80	90
70	87
60	82
50	78
40	72
30	67
20	59
10	49
00	8

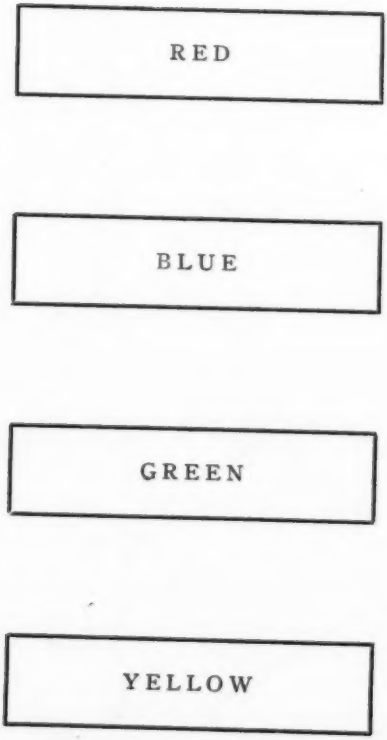
The tests were also used with a number of Italian and a number of colored classes. The results obtained from both differed so widely from those here reported that the writer omitted them from the compilation and reserved them for future report. A study of the tables here presented reveals in several instances great variation in performance between parallel grades in different schools. A study of the causes of these differences is of interest from many angles, and brings to light many factors of practical importance for these Kansas City Schools. The present article is designed simply to present the Picture Game as a new and possibly useful form of test, to describe it and give explicit directions for its use. To preserve the clarity of this purpose discussion of the problems mentioned in this paragraph is here omitted.

PICTURE GAME

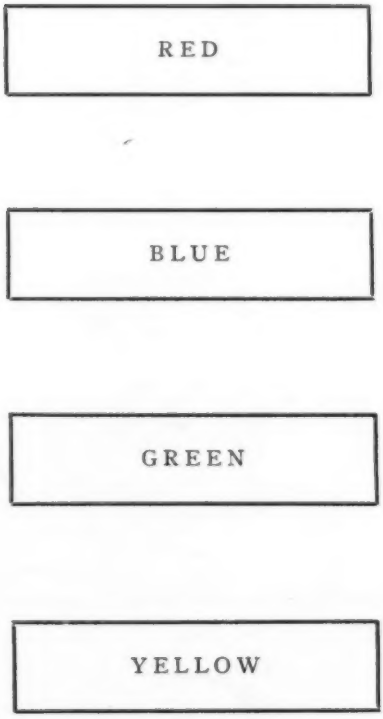
Name .....







NOTE.—On test sheets blocked spaces are colored as indicated.



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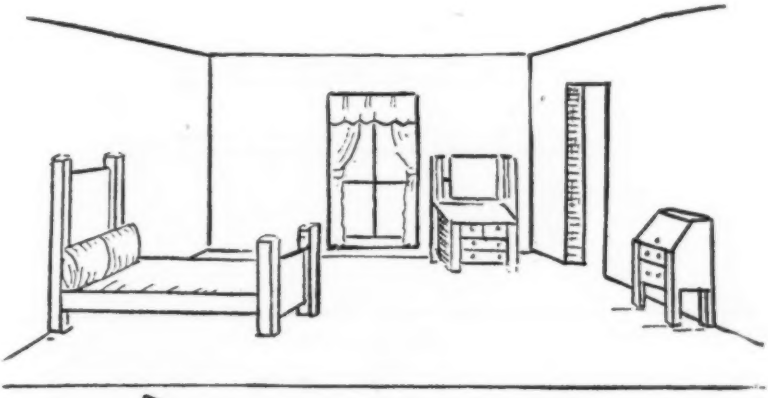

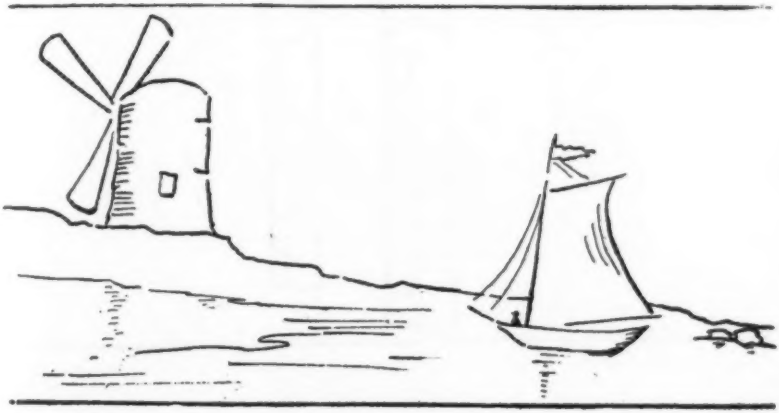

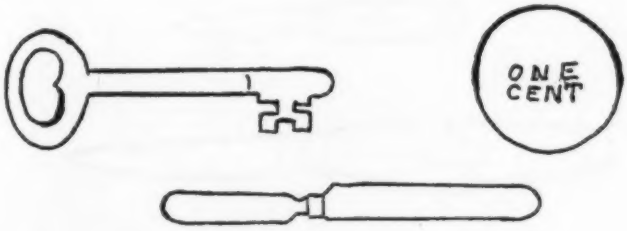
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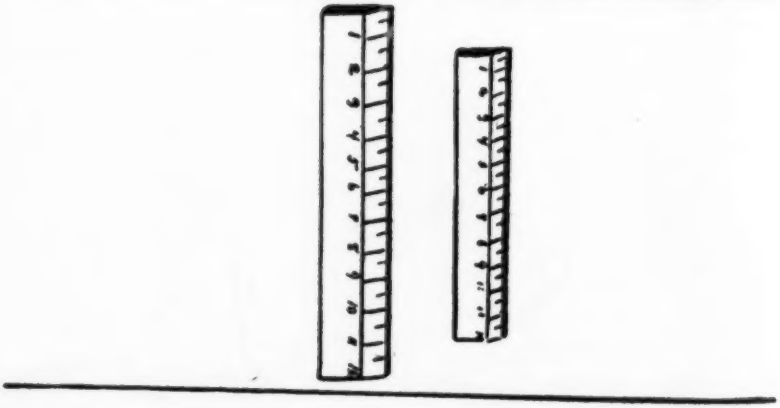
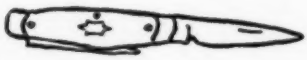
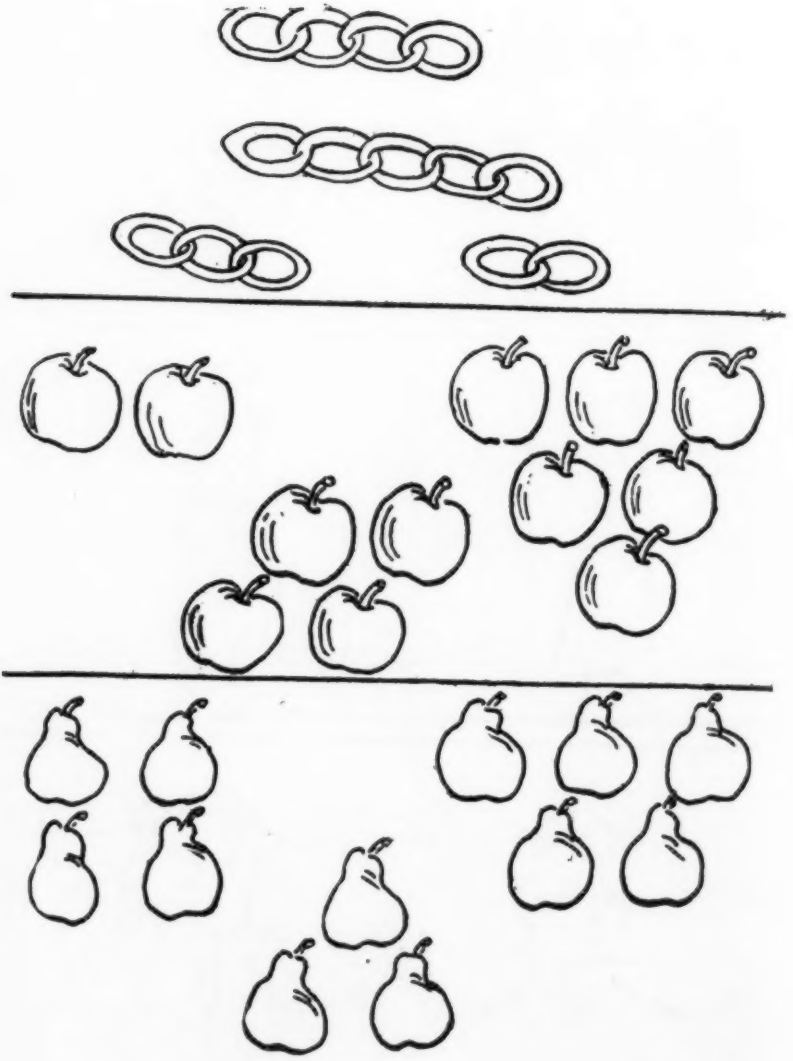
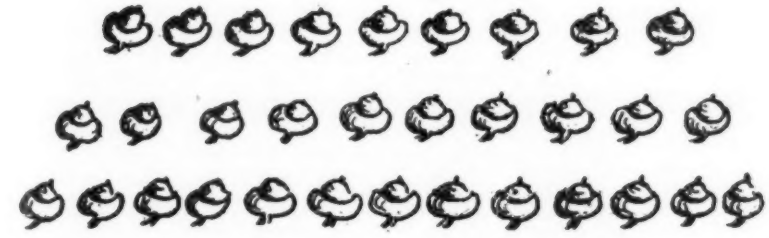
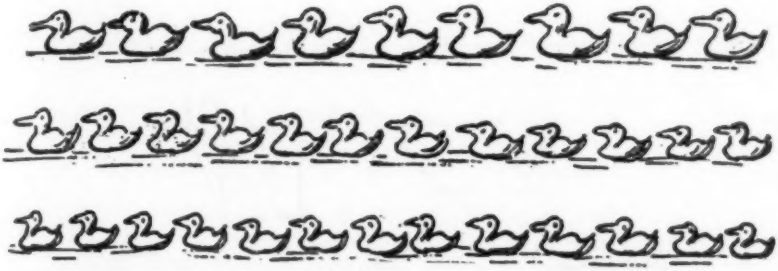
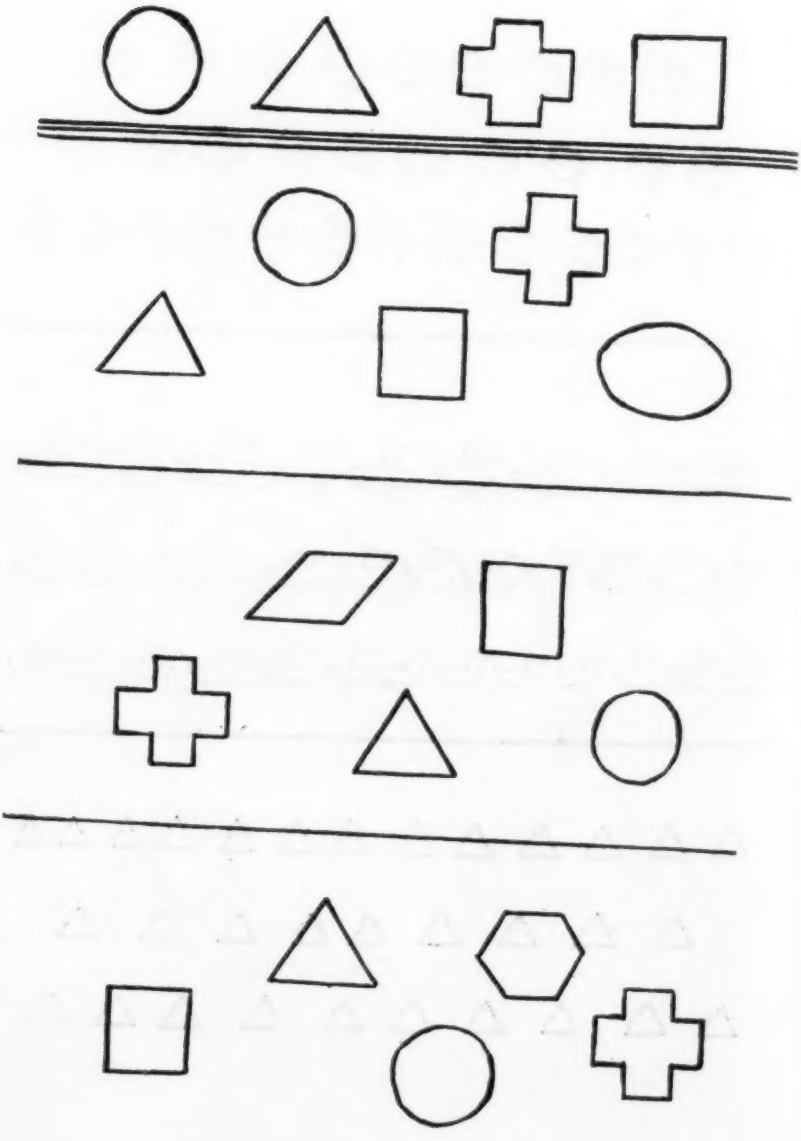


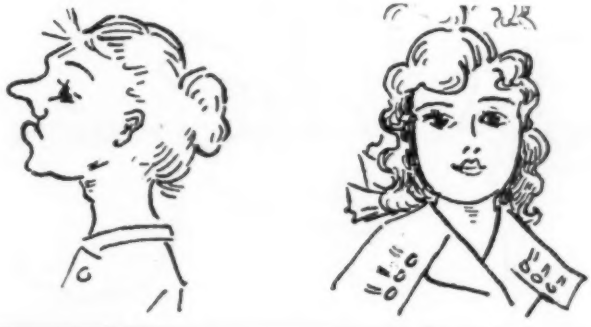


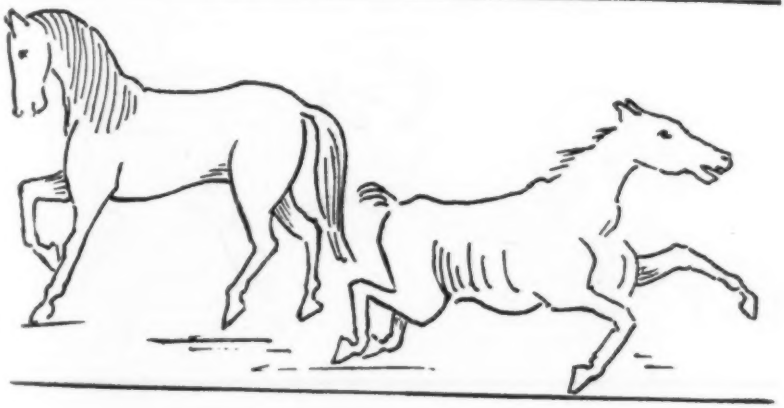


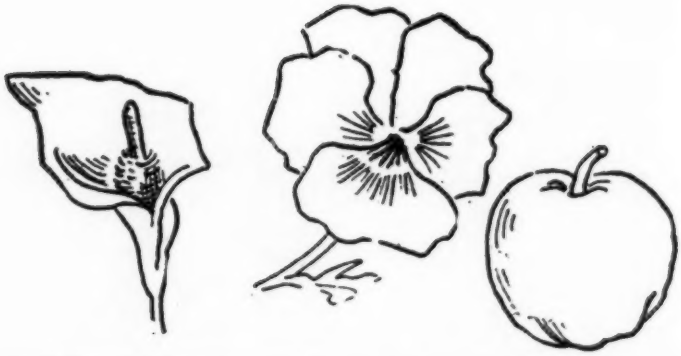


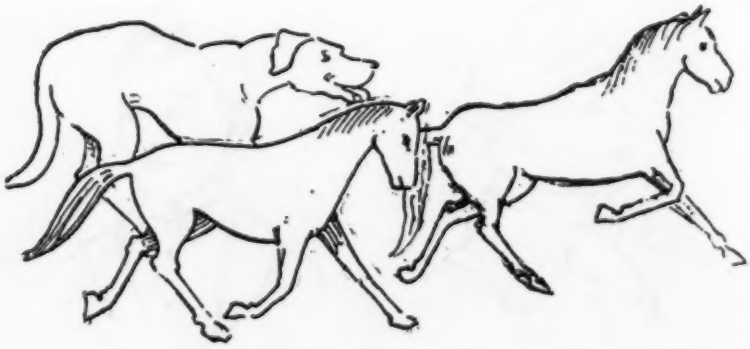


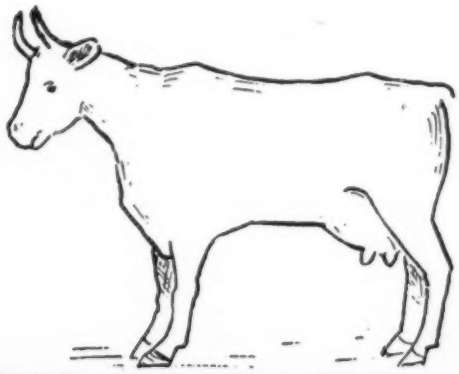


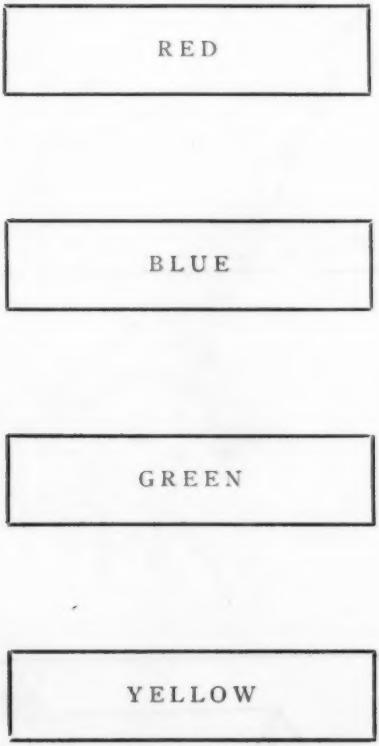












NOTE.—On test sheets blocked spaces are colored as indicated.

The booklets referred to above may be obtained from Clara Harrison Town, 2328 N. 22nd St., Philadelphia, Pa.

STANDARDIZATION OF THE WHIPPLE-HEALY TAPPING TEST

Prepared under the Direction of AMY HEWES, by ELSIE BONITZ, AGNES DAVIS, PERSIS MOORE, CHARLOTTE PORTER, FLORENCE TURNER, Students in the Course in Statistics at Mount Holyoke College

The present study is a standardization of a test for measuring speed and accuracy of eye-hand co-ordinations. It was made in the spring of 1921 by five students in the course in Statistics at Mount Holyoke College. The central tendency was estimated for each age group in a total of 2,253 children, ranging in age from seven to seventeen years, in order that

TABLE 1

NUMBER OF CHILDREN TESTED BY AGE GROUPS

Age in Years	Number				
	All Records			Chicago and Boston	Holyoke and South Hadley
	Total	Boys	Girls		
Total	2253	1444	809	1855	398
7 and less than 8	155	81	74	21	134
8 and less than 9	156	84	72	48	108
9 and less than 10	166	97	69	103	63
10 and less than 11	159	103	56	103	56
11 and less than 12	158	119	39	126	32
12 and less than 13	180	136	44	177	3
13 and less than 14	208	141	67	206	2
14 and less than 15	322	224	98	322	..
15 and less than 16	331	231	100	331	..
16 and less than 17	317	190	127	317	..
17 and over	101	38	63	101	..

the performances in any given case might be rated and used as one of a group of results on which to base vocational advice.

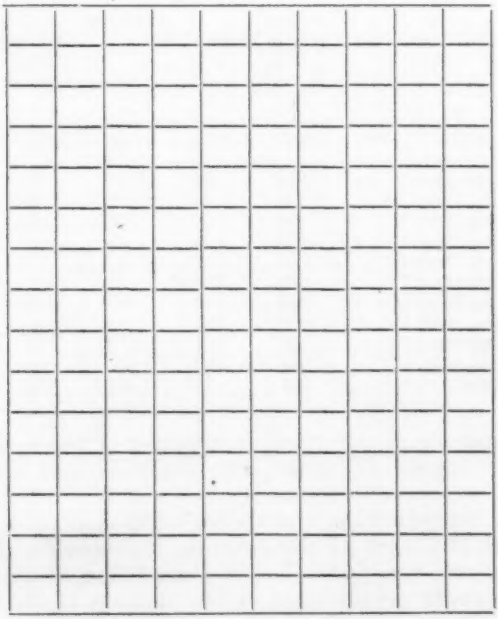
The data comprised the records for 1,855 tests made in connection with the work of the Juvenile Psychopathic Institute in Chicago, and the Judge Baker Foundation in Boston, in both places under the direction of Dr. William Healy and Dr. Augusta F. Bronner, and the records for 398 tests made of

children in schools in Holyoke and South Hadley for the purposes of supplementing certain of the age groups where the numbers were not sufficient. Care was taken to give the latter in schools in different sections of the city in order to get as varied a selection of children as possible. The records were all of children classified as normal mentally.

It was at first thought necessary to secure a minimum of 150 cases in each group, but later, when it was desired to make a comparison between girls and boys, some experimentation led to the belief that 80 were sufficient for a fair basis, for the reason that the median for this number remained unchanged when the group was increased.

The Test

The purpose of the tapping test is to determine speed and accuracy of eye-hand co-ordinations of the child. For the test a sheet of paper is used on which is printed a rectangular form divided into 150 half inch squares, as shown in the following diagram.



The test is given in a room where there is nothing to disturb or distract the child, and the examiner tries as nearly as possible to put him at his ease. The subject is seated at a table and told to tap across the paper (placed as illustrated) once in each square, as rapidly as possible without making any mistakes, the procedure first being demonstrated. An error consists of putting more than one dot in a square, touching the line, or skipping a square. Thirty seconds are allowed for each trial. After the first trial the paper is turned around and the test is repeated.

The best of these two records is used in grading.

Directions

The examiner says, "This is a test to see how well you can use your hands. This is how you do it. When I say, 'Go.' you are to put a little tap like this (show how the taps are rapidly made across one row and back on the next line), one in each square, never missing a square and not touching any lines. See in how many squares you can tap till I say 'Stop.' Sit comfortably with your arm the way you want it."

Have a stop-watch in hand and be in position to closely observe performance for errors. Start watch exactly as you say "Go," and say, "Stop," when watch is exactly at 30″, noting where pencil of subject is at this time.

After first trial turn paper upside down, erasing dots if space is needed, and get second record for 30″ on the same sheet, saying, "Now, let us see if you can do better a second time."

If the subject is too careful about making large dots or lines warn him that only light taps are necessary. Endeavor to stimulate if lethargy is shown on first trial. If hesitation because of error at any time, tell subject quickly to go ahead.

Scoring

In scoring the test three points are taken into consideration: the speed, which is expressed numerically as the total number of squares tapped; the error, or the number of mistakes which are made; and the index, which is arbitrarily defined to be the speed minus twice the number of errors.

In establishing standards for the different age groups the median was chosen to indicate the normal performance of the children of a given age. Since one-half of the children stand above this point and one-half below, the figure may be taken

TABLE II

Total Distribution for Tapping Test

Number of Squares Tapped	Ages																														
	7 and under 8			8 and under 9			9 and under 10			10 and under 11			11 and under 12			12 and under 13			13 and under 14			14 and under 15			15 and under 16			16 and under 17			17 and over		
	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls
Total	155	81	74	156	84	72	166	97	69	159	103	56	158	119	39	180	136	44	208	141	67	322	224	98	331	231	100	317	190	127	101	38	63
Less than 20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—
20 and less than 25	1	1	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25 and less than 30	9	5	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
30 and less than 35	13	9	4	2	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35 and less than 40	18	10	8	7	4	3	1	1	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40 and less than 45	33	20	13	29	19	10	12	9	3	—	—	—	—	—	—	—	—	—	3	2	1	—	—	—	—	—	—	—	—	—	—	—	—
45 and less than 50	23	12	11	31	16	15	19	12	7	6	5	1	2	2	—	1	1	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—
50 and less than 55	33	15	18	26	16	10	28	18	10	17	15	2	9	8	1	3	3	—	4	3	1	1	—	1	—	—	—	1	1	—	—	—	—
55 and less than 60	14	7	7	21	11	10	32	21	11	20	17	3	13	12	1	12	11	1	6	6	—	1	—	1	3	2	1	1	1	—	2	1	1
60 and less than 65	7	1	6	20	11	9	28	15	13	35	23	12	25	22	3	26	23	3	20	15	5	16	13	3	11	10	1	7	5	2	1	—	1
65 and less than 70	2	1	1	12	4	8	21	12	9	25	17	8	25	22	3	18	14	4	23	19	4	24	21	3	18	14	4	6	5	1	3	1	2
70 and less than 75	2	—	2	5	2	3	11	2	9	20	8	12	31	25	6	43	29	14	35	24	11	37	31	6	42	31	11	37	30	7	5	—	5
75 and less than 80	—	—	—	1	—	1	11	5	6	17	8	9	23	11	12	26	23	3	32	26	6	50	36	14	45	35	10	38	26	12	9	5	4
80 and less than 85	—	—	—	—	—	—	2	1	1	8	4	4	17	12	5	22	16	6	34	20	14	69	53	16	47	39	8	52	27	25	16	4	12
85 and less than 90	—	—	—	1	—	1	—	—	—	6	3	3	5	2	3	15	10	5	12	6	6	41	25	16	53	40	13	44	26	18	11	5	6
90 and less than 95	—	—	—	—	—	—	1	1	—	4	2	2	3	2	1	6	5	1	22	12	10	37	22	15	52	35	17	44	28	16	9	5	4
95 and less than 100	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2	3	1	2	12	5	7	23	13	10	16	5	11	31	15	16	15	8	7
100 and less than 105	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	3	—	3	2	1	1	10	5	5	23	11	12	22	10	12	14	4	10
105 and less than 110	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1	1	1	—	7	3	4	7	2	5	15	6	9	6	3	3
110 and less than 115	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	1	—	1	1	—	1	2	1	1	6	4	2	10	5	5	1	1	—
115 and less than 120	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	1	2	—	—	—	4	3	1	5	1	4
120 and less than 125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	6	1	5	1	1	—	4	—	4
125 and less than 130	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	1	—	—	—
130 and less than 135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135 and less than 140	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—
140 and less than 145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—
145 and less than 150	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—

as descriptive of the ability of the ordinary or normal child, and is therefore called a norm.

The individual performances of the children of the different age groups are exhibited in Table II. The figures show a marked and continuous development in motor co-ordination as the age increases, with only a slightly smaller increase in the rate of improvement for the older children than for the younger.

TABLE III
MEDIANS FOR TAPPING TEST

Ages of Children Tested	Medians								
	Speed			Error			Index		
	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls
7 and less than 8	45	44	47	0	0	0	43	43	45
8 and less than 9	52	50	53	1	1	1	48	46	53
9 and less than 10	58	56	60	1	2	1	55	52	58
10 and less than 11	65	62	70	1	1	1	62	61	69
11 and less than 12	70	67	76	1	1	0	67	65	75
12 and less than 13	72	71	77	1	1	1	70	69	74
13 and less than 14	76	75	81	1	1	0	74	72	80
14 and less than 15	82	80	86	1	1	1	79	77	84
15 and less than 16	84	82	90	1	1	1	82	80	88
16 and less than 17	86	85	89	1	1	1	84	82	87
17 and over	91	93	90	1	1	0	89	90	89

It will be observed from Table III that the speed with which the task is accomplished is the important factor in determining the index to represent the performances of the groups of children of various ages, for the number of errors is small and appears to have slight relation to age. One error was the median for all ages except for the youngest children. If the boys and girls are taken separately, it is seen that the majority of the girls in three of the groups of older children made no errors. As a consequence of the small number of errors, the index number follows very closely the general trend of the curve for speed.

A question which is opened by these figures is that of the relative ability of boys and girls. The curves show that the girls tested have developed motor skill earlier than boys, and that they maintain a small, but nearly constant degree of superiority until the age of 17, approximately, is reached, when they are overtaken by the boys. The numbers tested are not sufficiently large to warrant generalizations as to the relative ability of girls and boys of various ages in other performances of this kind. They do, however, indicate that the field would be a fruitful one for further experimentation, especially in view of the importance of the results for practical use.

FIGURE A
MEDIANS FOR SPEED BY AGE GROUPS

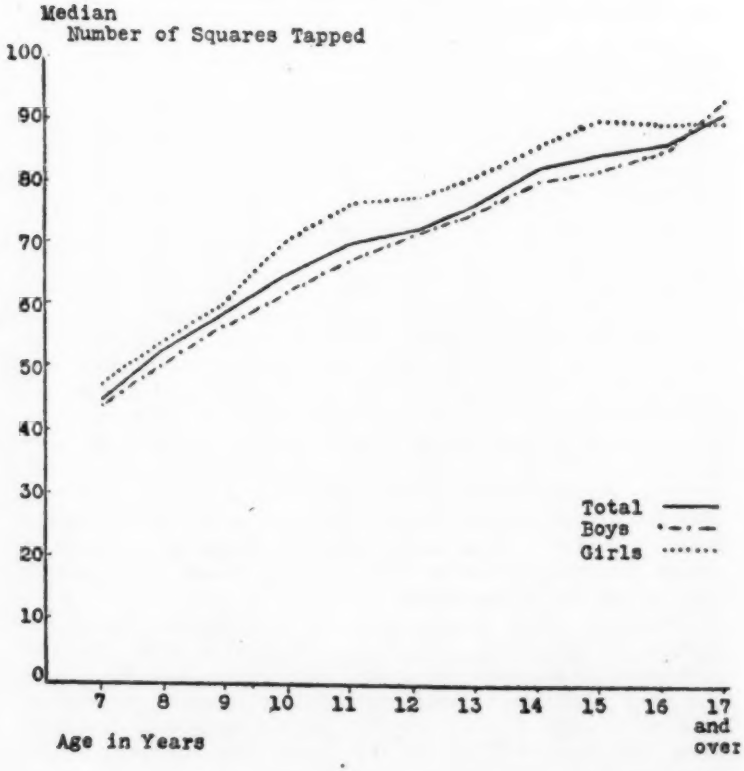
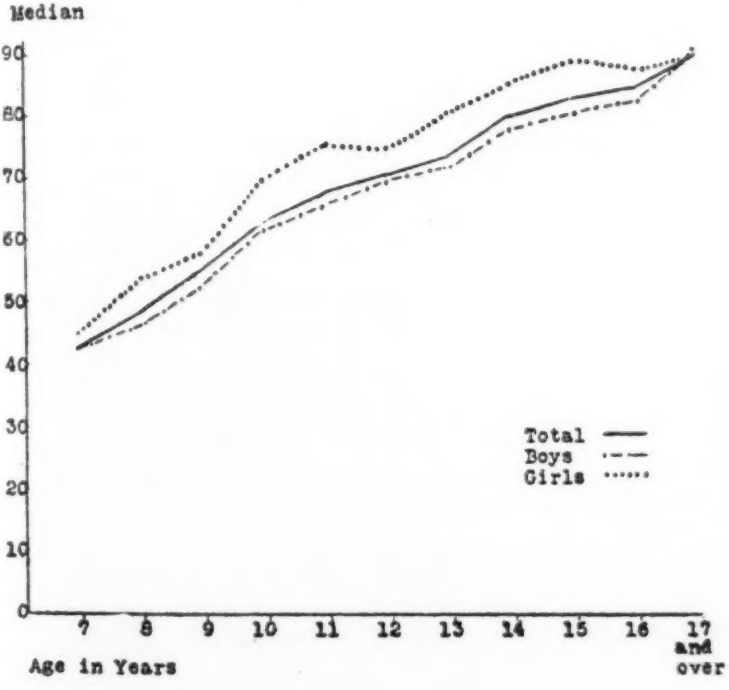


FIGURE B

MEDIANS FOR THE INDEX BY AGE GROUPS



SOME FACTORS OF AESTHETIC JUDGMENT

By Mrs. Anne Ross Reymert

CONTINUED FROM MARCH ISSUE

Experiment XVII[1]

Series S. Judgment based on degree of suggestiveness of an idea,—i.e, the concept of "Spring" in illustrated Spring advertisements of similar size, non-colored, from which all word matter was removed. The advertisements involved a great variety of suggestions, which fact was fruitfully brought out by the reasons for choice noted by the observers.

From the average rankings, which give an idea of the placement of the pictures:

Labels of pictures	Girls	Boys
1	3	1
2	1	5
3	2	6
4	9	7
5	10	10
6	8	4
7	6	3
8	5	8
9	7	9
10	4	2

the following individuals correlations with the average group rankings of the sex-groups, respectively, are derived:

Girls:

mf	me	tk	ec	ml	ad	ar	gl	mr	bt	ch	gs
0.89	0.36	0.64	0.79	0.79	0.27	0.59	0.20	0.24	—0.09	0.67	0.90

Boys:

CC	GJ	HH	LB	CS	NE	LH	WD	EO	DN	RG	EK
0.07	0.52	0.50	0.03	0,27	0.85	0.49	0.28	—0.52	0.48	0.38	0.48

Average correlation of girls as a group 0.52
Average deviation of girls as a group ± 0.27
Average correlation of boys as a group 0.32
Average deviation of boys as a group ± 0.24

The correlation between girls and boys as one group=0.50.

[1] In all the following experiments the observers were requested to note the reasons upon which their judgments were based.

That the girls as a group agree so much better among themselves, than do the boys among themselves, seems to be due among other factors to their having a typical high degree of suggestiveness towards "Spring," (as their reasons for choices bring out,—regarding Spring clothing, etc.). Their broader range of variation seems (from the reasons given) to have its foundation upon a generally wider imagination, as regards the above Spring advertisements. Spring is in many respects a more decidedly outstanding season of the year for girls than for boys, and gives them more suggestions, thus making the degree of certainty in choice less.

Comparing our results in this test with the results of Series C., in which suggestiveness of a concrete object was involved we see that the sexes there agreed with each other to a much greater degree (0.79 as against 0.50 in Series S), and thus were on more common ground in their judgments. Also in Series C. the girls have a greater variability among themselves than the boys (girls ± 0.25, boys $\pm$ 0.21), which seems to restate the fact of their having a greater general range of suggestiveness, and therefore, a lesser degree of certainty in placing the pictures by actual votes.

From the reasons given for choice it is clear that one and the same picture has been given the same rank by different observers, often for reasons having very little relation to each other.

Considering the factor of suggestiveness brought into an aesthetical judgment then, we may state, that a very complex process of judgment evolves which is based upon a variety of reasons.

Some Reasons for Choice

Girls:

(i) First appearance of his new straw hat.
(j) Lambs and young birds most probable in Spring.
(a) Young chickens just hatched.
(d) *She* dressed in Spring clothes, but it is not warm enough yet for *his straw hat.*
(g) Spring millinery.
(f) Weddings more frequent in Spring.
(e) Unsatisfied with winter hat,—he is too warm for it.

I. (f) The huge raindrops I at once associate with April weather. Then, too, the Spring look upon the young man's face helps to carry out the idea of April showers.

(j) The thing which suggests Spring most in this picture is the birds. The gamboling lamb is also suggestive of Spring. The hare one associates with Easter.

(a) Chickens are for the most part suggestive of Spring. The rabbit and chick one connects with Spring.

(c) The hare trying on a new hat and gazing in the mirror remind one of the usual custom of buying a new Spring hat.

(d) The ladies' skirts blown by the brisk Spring winds.

(c) The young chap is so glad that Spring is here that he climbs up into the newly leaved tree.

(a) The young man is presenting someone with a straw hat; however, I usually associate a straw hat with Summer rather than Spring.

(f) It is an old saying that in Spring young men lightly turn to thoughts of love; this sketch is, however, more suggestive.

Boys:

II. Spring to me means first showers, then flowers, thus ("f" was most suggestive of rain, then spring lambs, in "j," came next, "c" with birds, flowers and boys came third, with golf came fourth, little children fifth. The others mostly suggested Spring styles.

III. (c) The airiness.

(d) The opening of feathers like awakening of Spring, with young people taking part.

( ) Volubility of birds and light-heartedness.

(b) Bright flowers.

(a.f.h.) Excitement and joy of Spring. The first two, harmony.

(i) Awakening of interest: blossoming out in new hat.

(e) No reaction.

Experiment XVIII

Series AA. Judgment based on picturesque effect in *nine* scenes illustrating Dutch costumes of similar rich colorings in the foreground. As in the foregoing experiments the observer's attention was explicitly directed to one factor, here to the picturesque.

Average Rankings:

Labels of pictures	Girls	Boys
1	7	6
2	9	7
3	8	9
4	2	2
5	4	3
6	6	8
7	1	1
8	5	4
9	3	5

Individual correlations with their respective sex-group rankings:

mf	me	tk	ec	ml	ad	ar	gl	mr	bt	ch	gs
0.28	0.10	0.90	0.02	0.55	0.83	0.81	0.75	0.80	0.71	0.83	0.45
CC	GJ	HH	LB	CS	NE	LH	WD	EO	DN	RG	EK
0.42	0.77	0.53	0.63	0.70	0.87	0.43	0.67	0.63	0.33	0.60	0.40

	Average Correlations	Average Deviations
G.	0.59	±25
B.	0.58	±13

Correlation between girls and boys as one group=0.87.

Also here there is a very distinctly greater agreement between the sexes, than within them, one of the highest throughout.

The high uniformity of judgments, and the comparatively small average deviations, as well as the distinctly high correlation between the sexes as one group, indicate that there has been a very similar high uniform aesthetic reaction, pointing to a clear-cut impressionistic response.

From the reasons given for choice it may be inferred that the picture is generally reacted to as a whole, as some sort of an immediate, undefinable oneness, (which fact was also corroborated by the oral comments of the observers.) The observers were at a loss in *searching* for *reasons* after the choice was made and reflected longer before doing so. They all expressed spontaneous aversion and some positive inability to analyze their motives.

Words like "setting," " natural surroundings," "color effect," " atmosphere," etc., all suggest generic homogeneous reaction.

Some typical reasons for choices:

Girls:

I. (a) Presence of windmills—extreme dress of woman and child—coloring.

(g) Sheep—Naturalness of woman.
(c) Quaintness of girls—bright coloring—background.
(d) Water scene—dainty coloring—quaint figures.
(h) Little town in distance—rather elaborate dress of woman.
(e) Coloring—old age and youth.
(b) Sameness of coloring—children's activities—boats.
(f) Simplicity.

II. (a) Few strokes, atmosphere.
(b) Atmosphere and motion.
(c) Atmosphere.
(d) Motion.

III. Judgment was based on color, scenery, characterization.

Boys:

I. (a) 1 I believe the women are in a typical attitude—that is, of resting just before going to or leaving the market, the row boat in the background and the sail boat adds picturesqueness to the whole.

(g) 2 The occupations of the people shown here in their environment is pleasing.

(i) 3 The three figures in the foreground give one an impression of peace and industry—the manner in which they have squatted themselves on the sand is interesting.

(h) 4 The bright colors in the aprons and skirts is pleasing.

(f) 5 The plain rough clothing worn by the woman harmonize with the fishing ships in the background.

(e) 6 The coloring here, although bright, is pleasing and the gradual dwindling of the line marking the water and sky gives me the impression of great distance.

(c) 7 The prosperity of the country is evident. The sail boats as well as the green grass suggest picturesqueness.

(a) 8 There is nothing very striking about this picture, except the odd costume.

(b) 9 I do not like the tranquil, modest expression and attitude of the two young women.

II. (a) 1 The most picturesque costume appeals to me first—local peculiarities of dress (first group.)

(b) 2 Peculiarities of surroundings, quaint scenery, sheep raising (rural), fishing town—(second group.)

(c) 3 Striking color presentation, unusual contrast of pleasing colors (third group.)

The reaction reminds one of the definition of William James of "Extensity" as a primary basic element in sensation; the "vastness" or "bigness" of a primary visual impression, as given by him; the extensity of sound volume as introduced by Watt. Is there a similar, primary, sensory, aesthetic reaction?

Experiment XIX

Series BB.—Judgment based on Preference, with a view toward permanent possession in observer's room.

Material.—Colored reproductions of famous paintings.

AVERAGE RANKINGS

Labels of pictures	Girls	Boys
1	2	4
2	4	9
3	8	7
4	9	2
5	6	6
6	1	1
7	7	10
8	10	8
9	3	3
10	5	5

Individual correlations with the average rankings of the sex-groups respectively:

fm	me	tk	ec	ml	ad	ar	gl	mr	bt	ch	gs
0.35	0.44	0.84	—0.35	0.60	—0.14	0.70	0.87	0.62	0.88	0.76	0.24

CC	GJ	HH	LB	CS	NE	LH	WD	EO	DN	RG	EK
0.50	0.58	0.48	0.50	0.19	0.09	0.45	0.59	0.19	0.82	0.88	0.15

	Average Correlations of the Sexes as Separate Groups	Average Deviations
Girls	0.48	± 0.31
Boys	0.45	± 0.20

Correlation between girls and boys as one group=0.44.

The above results demonstrate that when the aesthetic judgment, as here, is narrowed down to sharp individual taste, and the stimulus pictures have very little in common (except that they are all famous paintings of men and women,)—as might have been expected,—the individual differences stand out distinctly.

The reasons given range from "the picture that can give me ideas, to help me be of better service in the world," to "color, light and shade; technique," with all varieties in between.

Experiments XX—XXI

Judgment based on most effective portrayal of the feminine characteristic, Series CC, and, judgment based on most effective portrayal of the masculine characteristic, Series DD.

Material.—Ten representative portraits of each sex.

Average rankings by the girls and boys, as separate groups, respectively:

Series CC			*Series DD*		
Labels of Pictures	Girls	Boys	Labels of Pictures	Girls	Boys
1	1	5	1	2	3
2	8	7	2	9	10
3	3	6	3	7	6
4	2	4	4	10	9
5	9	9	5	3	2
6	7	8	6	1	1
7	5	1	7	4	4
8	10	10	8	8	8
9	6	3	9	5	5
10	4	2	10	6	7

Individual correlations with the average ranking of the *Girl* group:

	mf	me	tk	ec	ml	ad	ar	gl	mr	bt	ch	gs
CC	0.27	0.43	0.65	0.59	0.50	0.70	0.25	0.71	0.79	0.64	0.73	0.49
DD	0.31	0.90	0.83	0.22	0.49	0.60	0.79	0.44	0.87	0.55	0.79	0.61

Individual correlations with the average ranking of the *Boy* group:

	CC	GJ	HH	LB	CS	NE	LH	WD	EO	DN	RG	EK
CC	0.61	0.36	0.18	0.48	0.61	0.98	0.73	0.79	−0.01	−0.28	0.82	0.58
DD	0.55	0.95	0.89	0.90	0.68	0.41	0.84	0.82	0.19	0.62	0.77	0.68

The average correlation of the girls as a group in Series CC = 0.56.

The average correlation of the girls as a group in Series DD = 0.62.

The average correlation of the boys as a group in Series CC = 0.49.

The average correlation of the boys as a group in Series DD = 0.69.

Series CC

	Average correlations of the sex groups with their respective group rankings	A. D.
Girls	0.56	±0.15
Boys	0.49	±0.28

Correlation between the sexes as one group = 0.64

Series DD

	Average correlations of the sex groups with their respective group rankings	A. D.
	0.62	±0.18
	0.69	±0.17

Correlation between the sexes as one group = 0.96

Again greater agreement between the sexes than within them,—in both series,—is observed. These two experiments bear out a greater agreement in regard to the masculine characteristic (Series DD) than in regard to the feminine characteristic (Series CC) within each sex group. And still more striking is this agreement when the sexes are taken together as one group and compared—this correlation being the highest of any experiment throughout all twenty-two experiments.

In Series CC there is a greater agreement on the part of the girl group. In Series DD there is somewhat greater agreement on the part of the boys. Also the difference in agreement on the same sex is approximately equal.

The boys are much more in agreement on their own sex, than the girls are on theirs.

From the reasons given the choice of the girls were based mainly on feminie charm and tenderness; and on motherliness by both boys and girls. Strength, determination and courage are the bases of judgment for the masculine characteristic by both sexes.

In regard to the agreement of the individual girl or boy with chance neighbors the following tables give a detailed account:

CORRELATIONS WITH CHANCE NEIGHBORS (Girls)

Series CC.

	mf	me	tk	ec	ml	ad	ar	gl	mr	bt	ch	gs
mf.....		0.43	0.43	0.04	0.03	–0.10	–0.10	0.08	0.05	0.47	0.01	–0.19
me.....	0.43		–0.01	–0.05	–0.44	0.37	0.32	0.21	0.45	0.33	0.15	0.05
tk.....	0.43	–0.01		0.62	0.48	0.00	–0.14	0.41	0.30	0.53	0.30	0.05
ec.....	0.04	–0.05	0.62		0.47	0.41	0.08	0.53	0.45	0.36	0.19	0.09
ml.....	0.03	–0.44	0.48	0.47		0.35	0.15	0.41	0.32	0.22	0.62	0.31
ad.....	–0.10	0.37	0.00	0.44	0.35		0.15	0.45	0.60	0.35	0.61	0.27
ar.....	–0.10	0.32	–0.14	0.08	0.15	0.15		0.09	0.41	–0.60	0.55	0.09
gl.....	0.08	0.21	0.41	0.53	0.41	0.45	0.09		0.90	0.40	0.43	0.25
mr.....	0.05	0.45	0.30	0.45	0.32	0.60	0.41	0.90		0.28	0.58	0.33
bt.....	0.47	0.33	0.53	0.36	0.22	0.35	–0.60	0.40	0.28		0.21	0.44
ch.....	0.01	0.15	0.30	0.19	0.62	0.61	0.55	0.43	0.58	0.21		0.42
gs.....	–0.19	0.05	0.05	0.09	0.31	0.27	0.09	0.25	0.33	0.44	0.42	
S.....												
11	0.14	0.21	0.28	0.30	0.31	0.32	0.17	0.38	0.42	0.33	0.37	0.21

Sum Correlations equals 3.44

CORRELATIONS WITH CHANCE NEIGHBORS (Boys)

Series CC.	CC	GJ	HH	LB	CS	NE	LH	WD	EO	DN	RG	EK
CC.....		0.12	0.68	0.70	-0.08	0.55	0.15	0.77	-0.36	-0.42	0.22	0.79
GJ.....	0.12		-0.05	0.20	0.19	0.28	0.41	0.35	0.53	-0.59	0.08	-0.19
HH.....	0.68	0.05		0.24	-0.16	0.15	-0.25	0.33	-0.25	-0.49	-0.24	0.55
LB.....	0.70	0.20	0.24		-0.10	0.47	0.15	0.66	-0.08	-0.42	0.18	0.48
CS.....	-0.08	0.19	-0.16	-0.10		0.63	0.76	0.09	0.41	-0.08	0.60	-0.05
NE.....	0.55	0.28	0.15	0.47	0.63		0.67	0.71	-0.05	-0.31	0.79	0.59
LH.....	0.15	0.41	-0.25	0.15	0.76	0.67		0.24	0.27	-0.08	0.78	0.09
WD.....	0.77	0.35	0.33	0.66	0.09	0.71	0.24		-0.39	-0.41	0.50	0.71
EO.....	-0.36	0.53	-0.25	-0.08	0.41	-0.05	0.27	-0.39		-0.08	-0.11	-0.67
DN.....	-0.42	-0.59	-0.49	-0.42	-0.08	-0.31	-0.08	-0.41	-0.08		0.18	-0.16
RG.....	0.22	0.08	-0.24	0.18	0.60	0.79	0.78	0.50	-0.11	0.18		0.38
EK.....	0.79	-0.19	0.55	0.48	-0.05	0.59	0.09	0.71	-0.67	-0.16	0.38	
S.....												
11	0.36	0.20	0.05	0.23	0.20	0.41	0.32	0.32	0.18	-0.28	0.34	0.33

Sum Correlations equals 2.30

Experiment XXII

Series EE.—Judgment based on degree of impressiveness of ten religious pictures.

Average rankings by the sex groups, respectively:

Labels of pictures	Girls	Boys
1	1	2
2	9	10
3	8	5
4	6	9
5	4	1
6	5	4
7	10	6
8	2	3
9	7	8
10	3	7

Individual correlations with the average ranking of the *Girl* group:

mf	me	tk	ec	ml	ad	ar	gl	mr	bt	ch	gs
0.27	0.76	0.38	0.54	0.67	0.37	0.28	0.88	0.41	0.62	0.15	0.22

Individual correlations with the average ranking of the *Boy* group:

GC	CJ	HH	LB	CS	NE	LH	WD	EO	DN	RG	EK
0.62	0.50	0.32—0.36		0.61	0.60	0.42	0.54	0.54	0.78	0.41—0.10	

Average correlations of girls and boys as separate groups		Average Deviations
Girls	0.46	±0.19
Boys	0.41	±0.23

Correlation between girls and boys as one group = 0.61.

As might have been expected, there is a great general diversity in choice here. Looking over the reasons given for the main choices by the girls:

"Christ's Humility for the Redemption of the World."

"The helpless are protected." "Motherhood."

"Biblical significances and symbolic Characters."

"Death, suffering, sorrow," etc.

We see how outspokenly they have been determined by biblical religion.

The reasons by the boys:

"Impressive surroundings conveying beautiful thoughts."

"Biblical significance." (The symbolism.)

"Death."

"Portrayal of suffering."

"Sympathy and fear," etc.

Biblical symbolism seems to play the greater part in all their judgments, and varies with the individual temperaments.

To get a somewhat *rough* measure of the degree to which the different girls and boys vary around the group standard judgment throughout the twenty-two experiments we may take the *average* of each individual's correlations with his sex-group in each experiment and compare this with the *average* of all twenty-two standard judgments of the sex-groups, as below:

AVERAGE CORRELATIONS WITH THE GROUP

(throughout all twenty-two experiments)

FOR THE INDIVIDUAL GIRLS AND BOYS

Girls:

mf	me	tk	ec	ml	ad	ar	gl	mr	bt	ch	gs
0.30	0.14	0.43	0.75	0.65	0.55	0.48	0.37	0.71	0.68	0.38	0.49
0.77	0.43	0.76	0.71	0.78	0.78	0.84	0.59	0.82	0.71	0.76	0.77
0.75	0.72	0.70	0.08	0.75	0.49	0.88	0.59	0.81	−0.31	0.77	0.88
0.53	0.85	0.85	0.25	0.53	−0.27	0.61	0.04	0.26	−0.04	0.02	0.54
0.88	0.84	0.52	0.73	0.76	0.28	0.87	−0.32	0.32	0.95	0.33	0.41
0.59	0.79	0.33	0.75	−0.05	0.84	0.77	−0.44	0.16	0.81	0.43	0.45
0.38	0.84	0.10	0.77	0.30	0.68	−0.22	−0.27	0.37	0.96	0.65	0.98
0.09	0.50	0.76	0.59	0.64	−0.45	0.65	0.47	0.84	0.65	0.78	0.25
0.71	0.83	0.84	−0.03	0.49	0.10	0.05	−0.07	0.07	0.81	0.09	0.13
−0.05	0.87	0.15	0.15	0.94	0.05	0.03	−0.05	0.05	0.92	0.12	−0.03
0.66	0.99	−0.20	0.98	−0.59	0.66	0.89	0.66	0.95	0.60	0.66	0.76
0.59	0.64	0.88	0.25	0.53	0.68	0.87	0.76	0.41	0.50	0.66	0.26
0.55	0.66	0.27	0.28	0.40	0.68	0.48	0.81	0.82	0.81	0.61	0.73
0.75	0.90	0.43	0.58	0.92	0.49	0.81	0.64	0.67	0.13	0.79	0.31
0.77	0.50	0.77	0.82	0.71	0.75	0.76	0.67	0.70	0.78	0.22	0.77
0.98	0.93	0.05	0.54	0.82	0.64	0.90	0.83	0.76	0.83	0.33	0.75
0.89	0.36	0.64	0.79	0.79	0.27	0.59	0.20	0.24	−0.09	0.67	0.90
0.28	0.10	0.90	0.02	0.55	0.83	0.81	0.75	0.80	0.71	0.83	0.45
0.35	0.44	0.84	−0.35	0.60	−0.14	0.70	0.87	0.62	0.88	0.76	0.24
0.27	0.43	0.65	0.59	0.50	0.70	0.25	0.71	0.79	0.64	0.73	0.49
0.31	0.90	0.83	0.22	0.49	0.60	0.79	0.44	0.87	0.55	0.79	0.61
0.27	0.76	0.38	0.54	0.67	0.37	0.28	0.88	0.41	0.62	0.15	0.22
S. 11.62	14.42	11.88	10.01	12.18	9.58	13.09	9.13	12.45	13.10	11.53	11.36
C. 0.53	0.66	0.54	0.46	0.55	0.44	0.60	0.42	0.57	0.60	0.52	0.52
A.D.0.23	0.21	0.27	0.29	0.22	0.30	0.26	0.35	0.25	0.26	0.24	0.23

Grand average correlation of the individual girls=0 53

Grand average deviation of the individual girls=±0.26

From the table we again see the general high correlation of each individual subject, both girls and boys, with their respective group judgment (the span of the girls being 0.42 to 0.66,—the span of the boys from 0.31 to 0.65.) The individual variability around the group judgment is on the whole the same for both sexes although the span for the girls is between 0.21 to 0.35, as against that of the boys, 0.16 to 0.35.

The average correlations of the group judgments of the sexes as separate groups are both high. However, the standard girl group correlation is higher than that of the boy group, which all goes to demonstrate that the girls agree better among themselves than do the boys throughout the twenty-two experiments in preference judgments of the kind here presented.

Boys:

CC	GJ	HH	LB	CS	NE	LH	WD	EO	DN	RG	EK
0.59	0.25	0.90	0.45	0.70	0.88	0.62	−0.30	0.90	0.24	−0.13	0.40
0.89	0.55	0.52	0.76	0.89	0.13	0.98	0.85	0.44	−0.19	0.08	0.21
0.71	0.72	0.72	0.82	0.62	0.41	0.62	0.38	0.41	0.62	−0.36	0.64
0.85	0.16	0.79	0.50	0.33	0.37	−0.02	0.28	0.50	0.14	0.38	−0.32
0.71	0.43	0.49	0.62	0.90	−0.07	0.75	0.35	0.42	0.66	−0.36	0.48
0.62	0.42	0.76	0.81	0.53	0.81	0.58	0.49	0.87	0.13	0.13	0.47
0.54	0.37	0.90	0.48	0.60	0.71	0.84	0.26	0.20	0.82	0.53	0.60
0.89	0.66	0.58	0.38	0.94	0.37	0.01	0.50	0.52	0.72	−0.37	0.18
0.82	0.66	0.62	0.10	0.41	−0.55	0.85	0.72	0.67	−0.19	0.19	0.36
0.84	0.36	0.82	0.78	0.28	0.81	0.84	0.61	0.94	0.07	0.37	0.55
0.70	0.81	0.28	0.90	0.89	0.77	0.14	0.78	0.88	0.70	−0.41	0.71
0.89	0.53	0.67	0.13	0.78	0.20	0.45	0.21	0.40	0.66	0.58	0.33
0.62	0.54	0.07	0.05	0.54	0.04	0.27	0.47	0.50	0.59	0.60	−0.19
0.24	0.22	−0.01	0.79	−0.03	0.52	0.68	0.47	0.13	0.04	0.73	−0.35
0.83	0.59	0.59	0.78	0.88	0.41	0.40	0.82	0.38	0.14	0.75	0.47
0.82	−0.07	0.26	0.98	0.87	0.95	0.92	0.89	0.33	0.48	0.09	0.64
0.07	0.52	0.50	0.03	0.27	0.85	0.49	0.28	−0.52	0.48	0.38	0.48
0.42	0.77	0.53	0.63	0.70	0.87	0.43	0.67	0.63	0.33	0.60	0.40
0.50	0.58	0.48	0.50	0.19	0.09	0.45	0.59	0.19	0.82	0.88	0.15
0.61	0.36	0.18	0.48	0.61	0.98	0.73	0.79	−0.01	−0.28	0.82	0.58
0.55	0.95	0.89	0.90	0.68	0.41	0.84	0.82	0.19	0.62	0.77	0.68
0.62	0.50	0.32	−0.36	0.61	0.60	0.42	0.54	0.54	0.78	0.41	−0.10
S. 14.33	10.16	11.86	11.51	13.19	10.56	11.21	11.47	9.51	8.38	6.76	7.37
C. 0.65	0.46	0.54	0.52	0.60	0.48	0.51	0.52	0.52	0.38	0.31	0.34
A.D. 0.16	0.26	0.21	0.27	0.21	0.32	0.24	0.21	0.21	0.31	0.35	0.25

Grand average correlation of the individual boys=0.49

Grand average deviation of the individual boys=±0.25

Grand average correlation between girls and boys as one group=0.68—with an average deviation of=±0.14.

See also Tables, pages 133 and 134

The deviation from the standard sex-group average correlation is practically the same for both sexes as separate groups, but only slightly higher than one-half of this when the sexes are taken together as one group. The latter plus the standard group average correlation between the sexes as one group, 0.68, shows a very high degree of agreement between the girls and boys, the correlation of the mixed-group being throughout the twenty-two experiments a conspicuous substantiation of the fact of greater agreement between the sexes as one group than within them as separate groups.

TABLE SHOWING THE CORRELATIONS IN ALL TWENTY-TWO EXPERIMENTS AND THE CORRELATIONS OF RELATED GROUPS OF SERIES

For Girls as a group (g)
For Boys as a group (B)
Between Girls and Boys as one group (Gr.)

Experiment Number	*Series*		*Materials*	*g*	*B*	*Gr.*	
1	A	Charcoal Drawings	Simple pieces of pottery	0.49	0.46	0.49	Average correlation between girls and boys as one group for the Charcoal Drawings Series=0.68
2	B		Pattern designs	0.73	0.51	0.77	
3	C		Different swirls	0.59	0.53	0.79	
4	I	Proportion Test	7 representative types of non-geometric figures, consisting of varying relations between two curved lines and two straight lines	0.35	0.33	0.84	For all Proportion Tests=0.71
5	II			0.55	0.45	0.65	
6	III			0.45	0.55	0.73	
7	IV			0.46	0.57	0.88	
8	IV(L)			0.48	0.45	0.59	
9	V			0.34	0.39	0.33	
10	VI			0.26	0.55	0.70	
11	VII			0.59	0.60	0.94	

Experiment Number	*Series*		*Materials*	g	B	Gr	
12	A & B	Arbor and Bird Day magazine cover illustrations; colored	Simple preference	0.59	0.49	0.43	
13	A & B (Color)		Color	0.60	0.34	0.78	For the Magazine Cover
14	A & B (Design)		Design	0.62	0.29	0.56	group of Series—0.59
15	D	Ceramic Art Designs	Non-geometric (Judged for design)	0.69	0.59	0.77	For Ceramic Art Designs—0.74
16	I		Geometric (Judged for intricacy of design)	0.70	0.60	0.70	
17	S		Illustrated Spring advertisements	0.52	0.32	0.50	

Experiment Number	*Series*		*Materials*	*g*	*B*	*Gr*	
18	AA		Dutch Costume	0.59	0.58	0.87	
19	BB	Post card reproductions (Colored)	—Paintings	0.48	0.45	0.44	
20	CC		Ten religious pictures	0.46	0.41	0.61	
21	DD		Ten portraits of women	0.56	0.49	0.64	
22	EE		Ten portraits of men	0.62	0.69	0.96	For the Post Card Reproductions=0.66
			Sum Average	11.72	10.64	14.97	
			Average Correlation	0.53	0.48	0.68	
			Sum average of Deviations	2.08	1.90	3.13	
			A. D. for all series	0.09	0.09	0.14	

From the above tabular arrangement we can readily gain a direct idea of the degree of correlation that was found between the various experiments that suggest a grouping with respect to relation and similarity in values tested or values that suggest types. The span is from 0.59 to 0.74 (neglecting experiments S and AA which show the extremes of 0.50 and 0.87.)

The following tabular arrangement of the correlations of the (1) girls, (2) boys, and (3) the sexes as one group, in gradation, according to degree of correlation, gives an oversight over the amount of general agreement there was among the three groups in their rating of the various aesthetic values experimented upon.

We see that for the three groups there is a span from 0.26 to 0.73 for the girl group, from 0.29 to 0.69 for the boy group, and one from 0.33 to 0.96 for the sexes as one group. The first two have practically the same span, the girls a slightly larger, and the third group has the largest span.

GRADED CORRELATIONS

Girls		Boys		Gr.	
Series		Series		Series	
B	0.73	DD	0.69	DD	0.96
I	0.70	VII	0.60	VII	0.94
D	0.69	I	0.60	IV	0.88
DD	0.62	D	0.59	AA	0.87
A & B (Design)	0.62	AA	0.58	1	0.84
A & B (Color)	0.60	IV	0.57	C	0.79
AA	0.59	III	0.55	A & B (Color)	0.78
A & B	0.59	VI	0.55	D	0.77
VII	0.59	C	0.53	B	0.77
C	0.59	B	0.51	III	0.73
CC	0.56	A & B	0.49	VI	0.70
II	0.55	CC	0.49	I	0.70
S	0.52	A	0.46	II	0.65
A	0.49	II	0.45	CC	0.64
BB	0.48	IV(L)	0.45	EE	0.61
IV(L)	0.48	BB	0.45	(IV(L)	0.59
EE	0.46	EE	0.41	A & B (Design)	0.56
IV	0.46	V	0.39	S	0.50
III	0.45	A & B (Color)	0.34	A	0.49
1	0.35	1	0.33	BB	0.44
V	0.34	S	0.32	A & B	0.43
VI	0.26	A & B (Design)	0.29	V	0.33

Summary Discussion

Series DD, involving the judgment of the masculine charteristic, shows the highest correlation, 0.96, between the sexes as one group, and is also the highest of all correlations. This may be due to greater popular agreement on the element suggested in this experiment.

Series VII. IV and 1, involved a very simple and clear proportion relation between two curved and two straight lines, and were therefore relatively easy to rank. Their correlations are 0.94, 0.88 and 0.84, respectively.

Series AA, involving a judgment of the picturesque effect, shows the high correlation, 0.87, between the sexes as one group. This may be due to the fact that this series, depicting Dutch costumes in a scenic setting, is popular, simple, rich in color effects, attractive, direct in its appeal, and so comparable that great difficulties in choosing were expressed by the subjects.

Series C. though not admitting of as ready judgment as the last named series, correlates very high, 0.79. The swirls in charcoal appeal to the imagination in a concrete, simple, direct manner.

Series A and B (Color), the Arbor and Bird Day magazine covers, correlates similarly high, 0.78. The covers as their name would suggest were of general human appeal, familiar as well as attractive in subject, and illustrative of life out-of-doors and of the outdoor world. That the element of color played an outstanding part is obvious from the correlation of this series when judged on the basis of color.

Series D and Series B, the former involving judgment on beautifully colored non-geometric ceramic art designs, and the latter involving judgment on charcoal pattern designs, correlated high and equal, 0.77; this in spite of the fact of their great difference. The general attractiveness of the designs as well as their direct concrete impressionistic appeal and decorative suggestiveness may account for the results.

Series III and VI correlate comparatively high, 0.73 and 0.70, in the proportion tests, perhaps for similar reasons as those above.

Series I, in which the judgment was based on intricacy of design, correlates high, 0.70, especially when it is considered that a more complex element is involved. Here the designs were also beautifully colored ceramic art designs but geometric and involving great intricacy of design.

Series II, and IV (L) of the proportion tests have a medium

high correlation, 0.65 and 0.59 respectively, due perhaps to being somewhat less direct in type and having a greater chance for confusion.

Series CC, involving judgment of the feminine characteristic, shows only a moderately high correlation, 0.64. This may be due to a greater diversity of individual taste and ideals in regard to the feminine than in regard to the masculine characteristic, as borne out by the reasons assigned for choices.

Series EE, the judgment being based on the impressiveness of a set of reproductions of religious paintings, correlates medium, 0.61, contrary to expectations from the comments of the observers regarding thier difficulty of choice. The biblically significant entered largely in this judgment.

Series A and B (Design) correlates only medium, 0.56, when judged on the basis of design, showing that design has a less general appeal than color—a racial development element as well as one of individual development.

Series S, which has its judgment based upon the suggestiveness of the idea of Spring in a set of Spring advertisements, involved a multiplicity of suggestions—the same picture being frequently chosen for altogether different reasons. Hence, as may be expected, the correlation is *comparatively* low, 0.50.

Series A and B, when a general simple preference judgment is passed upon it, correlates very much lower, 0.43, than when the judgment is based upon design,—showing clearly the presence of conflicting factors.

Series A, involved a judgment of technique of a set of charcoal drawings of two simple pieces of pottery drawn from various yet only slightly different angles. The low correlation, 0.49, was most likely due to the great homogeneity of this series.

Series BB, involving a judgment in regard to choice as a permanent possesion in the room of the observer, had generically nothing in common, save that they all were colored reproductions of famous paintings. The correlation, consequently is low, 0.44.

Series V, which required the finest discrimination of the proportion tests, the increments of increase in width being of the smallest degree of all these tests,—(the figure is the same as in Series VI),—correlated only 0.33.

Series C, which is suggestive of a concreate object, and Series S, which is suggestive of an idea (Spring) bear an interesting relation to each other, $C = 0.79$, $S = 0.50$, showing the part the entrance of the intellectual element plays.

Series D and Series A and B (Design), which involved

design, pure and simple, and design in illustration, respectively, bear a somewhat similar relation to each other, D = 0.77, A and B = 0.56.

The span between the sexes as one group is greater than the span for either sex group separately:

Group = 0.33 to 0.96
Girls = 0.26 to 0.73
Boys = 0.29 to 0.69

The variability in correlations, as well as the general agreement on some series, is readily seen in the above tabulation.

A *rough* rating of the subjects from the *personal impression* gained by the experimenter throughout the twenty-two experiments on the degree of *conscientiousness, general intelligence* and *confidence of judgment*, is inserted below, for possible purposes of comparison.

	Conscientiousness		General Intelligence		Confidence	
	Girls	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*
Above Average	ch ad ar tk	RG CS CC HH WD	cs me ad gl	CS WD RG CC HH	ch gl ad ar me	CS RG HH NE DN CC
Average	bt ec me gl mr	GJ DN NE EO LH LB	ar tk ec mr mf bt	DN NE GJ EK	tk bt mf ec	GJ WD
Below Average	ml gs	EK	ml gs	LH EO LB	mr ml gs	LH LB EO EK

A SHIFT OF EMPHASIS NEEDED IN PERSONNEL RESEARCH

By HARRY D. KITSON, Professor of Psychology, Indiana University

The term personnel research means to most people, to whom it means anything, the administration of tests—intelligence, "special ability," and trade tests—to persons applying for positions. As a matter of fact this is a much too narrow view. The analysis of the individual (for which tests are the generally accepted though perhaps not the ultimate implements) is only half, and the latter half of the business. A task of equal importance is the analysis of the occupation to which the individual is to be adjusted. This has been almost entirely neglected, however. The cult of tests for analyzing the individual, with its formalized ritual, has so dazzled its devotees as to blind them to the possibility of another method of approach to personnel problems. The unfortunate consequences are not merely the neglect of the indispensable analysis of occupations but also a stagnation in the development of tests.

For it must be admitted that despite the great attention paid to tests, they are contributing but little to industry, in terms of either bulk or quality of service. There is much talk about them, but it is in terms of what might possibly be accomplished if they were developed along the line of a particular theory of vocational guidance. The few cases in which they have been practically used are conspicuous because of their rarity; and have not generally been followed up as a regular matter of industrial routine. One who views the matter dispassionately, then, must admit that in spite of the attention tests have received (in talk) they have not made any appreciable progress in industry during the past five years. Despite the rose-colored dreams that are painted of an industrial system wherein each individual shall be placed on the road to success by means of a dramatic series of psychological tests, the application of tests to occupational situations consists in following a stereotyped prescription that brings no cure and no change. In the psychologist's own jargon it may be said that psychological tests in industry are on a distinct plateau.

In order to escape from this plateau the industrial psychologist may well follow the prescription given by his colleagues in the psychology of learning, namely, change his method. Instead of seeking to solve the problems of personnel work by testing the individual with artificial, extraneous tests, let him approach the operations of the occupation as the worker actually has to perform them. By doing so he will not only fulfill the demands of an adequate program of personnel research, but he will also probably unearth some method that will show the way off the plateau upon which tests now languish.

This idea of applying psychological technique to the analysis of occupations is not new in theory. The public interested in vocational guidance have urged it under the name, vocational analysis, meaning the analysis of the professions and trades; or under the name, occupational analysis, meaning the analysis of specialties within the trades. Within recent times employment managers have been urging it under the name Job Analysis, meaning the analysis of a particular operation on a particular piece of material or a particular machine. Almost all who have faced the problems of personnel administration have recognized the necessity of this analysis, and particularly its psychological nature, but very few have actually attempted it, and they with only scattered efforts. As usually conceived, the psychological analysis of an occupation[1] consists in describing the occupation by means of rough observation on the part of a psychologist in consultation with employment manager, foreman, expert workman and others. The psychologist may even perform the operation more or less haltingly himself in order to secure "local color." After some such rule of thumb observation the occupation is split up into a series of "unit operations." These are then embodied, for purposes of selecting fit workers, into a statement called the Job Specification, for which outlines of various kinds exist.[2] An analysis according to such a pattern may be of value for some occupations and some circumstances, but it is surely inadequate

[1] It is of course understood that a complete analysis of an occupation requires description in terms of the physical, physiological, social and economic phases as well as of the psychological.

[2] See, for example, H. C. Link, Employment Psychology, New York. Macmillan, 1919, p. 261.

Ordway Tead and Henry C. Metcalfe, Personnel Administration, New York, McGraw & Hill, 1920, p. 264-5.

Franklyn Meine, Job Specifications, Bull. No. 45, Fed. Bd. for Voc. Education, Washington, D. C., Nov. 19, 1919.

as a sole instrument of scientific personnel research in the broad sense. It should be amended in accordance with three principles of scientific method:

1. Analyze the occupation in terms of itself.

As at present conducted, most attempts at occupational analysis violate this in one of three ways.

a. According to one method greatly favored, the psychologist gazes at the occupation for a short time and then concludes: "This occupation requires concentration of attention, verbal memory, reasoning about new situations, etc. Here are tests a, b, and c, which measure these several activities (sic!). I will administer these tests to workers in the occupation and choose those tests wherein scores show the highest correlation with standings in occupational success." The "tested" activities *constitute* the activities of the occupation, in the eyes of the analyst; and the procedure is regarded as a piece of occupational analysis. Upon second thought the fallacy of this procedure is grossly apparent. It really delineates the occupation only in terms of extraneous tests, not in terms of the work itself. And it can be justified only on the obsessing hypothesis that tests with their wabbly indices of correlation are the most reliable tools of analysis.

b. Another practise much in vogue is to make a list of psychical traits supposedly required in an occupation—industriousness, affability, neatness, patience, assertiveness—and call them the analyzed components of the occupation. The chief objection to the listing of such traits is that they are abstract, characterizing a number of occupations and yet no occupation in particular. Again they are general; every occupation requires them in some degree. Finally, it is not yet established that a trait like neatness, for example, will express itself equally in all lines of activity. The greater likelihood is that each occupation involving it will require it in a specific form.

A good example of an attempt to overcome this last objection is furnished by an insurance company that desired to analyze out the psychical characteristics brought into play in the best quality of insurance salesmanship. Having discovered by trial the futility of using such general terms as those just mentioned, the company has attempted to formulate the required traits in terms of what the best salesman does in selling insurance. Thus, instead of scheduling a mythical, abstract, general trait like "dominatingness," the analyst asks

for a rating in this manner: "Does he (the best salesman) dominate the interview most of the time .....; half of the time .....; almost none of the time .....?" This method is not perfect; it involves a danger to be mentioned presently; it is only tentative; but it has the virtue of avoiding general terms that mean nothing; and it shows a praiseworthy attempt to analyze the occupation in terms of itself.

c. A third questionable practise among the current attempts at occupational analysis is that of seeking the components of an occupation in the opinions of expert workers. One of the most thoroughgoing applications of this technique is that of Martha Ulrich,[3] who has devised a schema consisting of a number of traits, which she presents to professional men—doctors, lawyers, etc.—with the request that they rate each trait according to the degree to which they think it essential in their occupation. Thus:

1 desirable	—1 undesirable
2 very important	—2 disadvantageous
3 absolutely indispensable	—3 very disadvantageous
0 unimportant	

More than 100 traits are scheduled, of the sort condemned in (b) above, such as: visual, auditory or motor type of imagery; ability to make new associations easily; ability to think in abstract terms; a strongly developed emotional life, etc. The judgments of all are then summed up to give a numerical weight to each trait as a component of each vocation.

This technique in its various guises constitutes a most precarious tool of vocational analysis. The dangers of subjective data that lurk in it emphasize anew the need for the kind of analysis urged in this paper, namely the analysis of an occupation in terms of itself instead of in terms of psychological tests, abstract non-existent general "traits," or opinions.

2. The second principle is, Express the requirements of the occupation in quantitative terms. For example, in describing the occupation of proofreading, one should, among other things, measure the output of a standard group of workers, and upon this basis, state the median requirement to be a speed of 900 lines per hour (of a certain kind of material) with no more than one error overlooked every 35 lines. Or, to change the illustration, one might state the speed required

[3] *Die psychologische Analyse der hoehen Berufe als Grundlage einer kuenftigen Berufsberatung.* Zeitschrift fuer Angewandte Psychologie, 13, 1918, pp. 1-36.

in linotyping at the upper ten percentile, to be 8,300 lines per hour with no more than one error in every 38 lines. Or one might describe typewriting of grade A as an output of 100 letters per day, B, 80 and C, 60.[4]

3. A third requirement is that the analysis should be made minutely. Perhaps the rough, non-quantitative kind now practised is adequate as a basis for selecting workers for certain gross unskilled occupations. But when one takes the pains to measure the reaction time of an applicant in fractions of a minute as one does in tests, one should have measured the object to which the worker must react (the occupation) with equal minuteness.

There are still other considerations that demand that occupational analysis should be made minutely. Analysis is necessary for purposes other than merely selection of workers. It may be used for discovering wasteful and fatiguing operations, as when Taylor found that to analyze such a gross job as shoveling required measures involving ounces; and Gilbreth found that to analyze the folding of handkerchiefs required chronocyclegraphs showing movements lasting but a fraction of a second. Again, analysis may be made for the purpose of discovering what factors are involved in learning an occupation, as in the analysis of telegraphing by Bryan and Harter and that of typewriting by Book. A more recent attempt by the writer in the field of proofreading illustrates the same requirement. The particular aim of the investigation was to secure a standard of eye-movement. The established technique for the measurement of eye-movements was employed, which permitted their reproduction in terms of the number and length of pauses. Table I shows these averages in fiftieths of a second for good and poor proofreaders reading the same twelve lines.

TABLE I

	Average number of pauses per line	M. V.	Average length of pauses	M. V.
Good	7.4	.48	17.1	1.66
Poor	11.0	2.00	19.3	3.64

"From these results we may draw the following conclusions: (1) a good reader makes on the average fewer pauses than a poor one—7 *vs.* 11. (2) A good reader makes on the

[4] Here again, the reader is reminded that the same kind of quantitative statements should be made on behalf of the non-psychological characteristics of an occupation.

average shorter pauses than a poor one—17 *vs.* 19. (3) A still more important matter is the demonstration of differences in regularity. The good proofreader reads very regularly. His eye-movements are so regular as to be almost rhythmic, with respect to both length of line and number of pauses. The poor proofreader, however, reads irregularly. These differences may be quantitatively stated in terms of the mean variations. The small mean variations in the record of the good reader indicate that he paused practically the same number of times in each line—on the average no more than eight (7.4+.48) times, and no less than seven (7.4—.48) times. The poor reader, however, paused in one line as many as thirteen (11.0+2.0) times and in another line only nine (11.0—2.0) times. In length, the pauses varied between 18.8 and 15.4 in the case of the former, and between 22.9 and 13.7 in the case of the latter."[5]

Résumé

Such are the three principles that should be followed out in any adequate program of occupational analysis; and such are the methods that should be employed. This rigid régime is admittedly arduous. It requires that the psychologist who would engage in personnel research must leave the shelter of his academic laboratory and enter the arena of occupations. He need not necessarily don a mechanic's cap or a mason's apron, but he must seek his data in the activities of the worker at work. He need not necessarily invent a battery of new instruments for the measurement of these work-activities. He may secure many of the necessary measures from the records of well-organized industrial and commercial establishments. There are vast quantities of such measures available to one who will gain the confidence of live business executives and show them by results that personnel psychologizing as described above will benefit not only personnel work in general but also their establishment in particular.

It may be objected that this program of minutely measuring occupations in terms of themselves is going to take a long time, and that the work of vocational guidance cannot wait, hence must proceed with the dubious makeshifts (particularly tests) described above. The answer is that to search for truth always takes time but is more economical in the long run. Or still more tartly, that tests are not leading to

[5] H. D. Kitson, Scientific Method in Job Analysis. *Jour. of Pol. Econ.* 29, June, 1921, p. 512.

speedy victory, and judging from the length of the plateau they are now on, cannot progress much farther in their present form. Hence, the most economical thing to do is to *lessen the emphasis upon tests, at least temporarily, and place more emphasis upon the scientific analysis of the occupation until it has reached a stage of refinement equal to that of the tests.* Then, perhaps, the way will be clear to improve the tests.

Again the objection may be raised that even after an occupation has been pretty well analyzed in terms of itself, the way will not have been opened for testing the ability of a novice aspiring to the occupation, for of course one could not be expected to perform the skilled operations required in the occupation before learning them. It is freely acknowledged that the reforms here advocated do not seem to offer a ready solution to the problem of selecting a candidate for an occupation by tests. Still it is possible that after a truthful analysis of the occupation is made, the way may be open for the development of the needed technique of vocational selection and guidance. One who would be bold enough to defy conventions might suggest further that perhaps it will turn out that tests are not the best tools to use after all. It is conceivable that a better way may evolve out of a well-directed search for light.

All apart from its bearing upon tests, however, the scientific analysis of occupations here advocated is bound to result in a number of benefits to personnel work conceived in its broader sense: 1. It will reveal errors and wastes that may be present in an operation, thus reducing the worker's fatigue and bringing profit to both worker and employer. 2. It will furnish basis for establishing standards of performance that may be demanded of employees. 3. It will assist in scientifically setting a wage consistent with the amount of work done. 4. In connection with jobs involving the use of machinery it may give information regarding more effective ways of adjusting, operating and maintaining machines. 5. The cost department may use accurate measures of the units of an occupation in estimating more closely the cost of new jobs about to be contracted for. 6. Analysis may conceivably be used in arranging harmonious grades and routes of promotion, showing the points of overlapping in the duties and qualifications of various jobs, and thus indicating at what stages workers traveling various routes may be interchanged. 7. Scientific analysis is an indispensable preliminary to the invention of a trade test. 8. Finally, it is a prerequisite to adequate occupational training.

In short, a scientifically defensible theory and administration of occupational analysis will result in many benefits not specifically foreseen; as happened in England when the Industrial Fatigue Research Board, organized during the war in order to "promote better knowledge of the relations of hours of labor and of other conditions of employment including methods of work to functions of the human body," discovered facts and developed techniques that have since been found directly applicable to the solution of problems other than those at first proposed.

The secret is that under the plan here advocated, the personnel psychologist will be working not with spurious extraneous materials, but with the actual stuff of occupations. And when he sheds obsessing theories and seeks for facts in the realm of reality he is bound to discover truth even if not in the form expected.

THE USE OF THE PERSONAL HISTORY BLANK AS A SALESMANSHIP TEST

By DOROTHY B. GOLDSMITH, The Guardian Life Insurance Company of America

This study was made to determine whether the items of a personal history blank could be used to predict the success or failure of a salesman. That is, whether a weighted, quantitative score could be given to the answers to questions upon a history blank, in order that it might be used as an elimination test. To accomplish this, the scoring of the blank had to perform two functions,—(1) it must eliminate failures, and (2) it must *not* eliminate successes. The chief purpose was, therefore, the establishment of a critical score, a score below which would fall the failures and above which would lie the successes.

The attempt embodied in this study was successful; a lower critical score was established at a point which for the 502 blanks studied, eliminated 54% of the failures, but left 84% of the successes with the company. For this group the establishment of an upper critical score was unnecessary.

In this experiment the personal history blanks of 502 salesmen of The Guardian Life Insurance Company of America were studied. For the life insurance field in particular, though it would hold good in some measure in the case of any large organization, there is a peculiar advantage in adapting the personal history blank to this purpose. In this business, branch offices are maintained all over the country, and it is an extremely difficult task to persuade the branch managers to use tests, and a well nigh impossible one to have the tests given under standardized conditions. The personal history blank, however, has for some time been a routine part of the application for a sales license. As its name implies, it contains information concerning the applicant's personal history and past experience. Almost every firm uses a blank of some description and its completion presents no novel task. The manager has become accustomed to having this blank completed by his new men, and, in turn, to sending it on to the Home Office. In the past, this blank had been required for every agent of the company under discussion. There had

been no attempt, however, to give it any scientific treatment; the personal history blank had served rather, in the main, merely to strengthen or weaken the general impression made by the applicant. Certain items whose presence or absence were deemed significant were checked, and the remainder of the blank was taken as a whole to determine by its general tone whether an applicant should be licensed or dropped as a possibility.

To secure the proper scoring for the blank, the results of a study made about a year ago on 34 salesmen were taken as a tentative guide.[1] Fifty history blanks representing three classes of agents whose production records were known were selected. These classes were (1) those who were failures, (2) those who were borderline cases up to moderately successful, and (3) those who were successful. The criterion of success was the amount of insurance paid for during the first year after the man was licensed. (We had already found out that the first year's production was a very good index of future production.) It would be well here to mention that the only factor which determined the selection of the 502 blanks was whether or not the agent's first year's production record was available. The blanks for these three classes of men were then studied and the essential or significant items which varied with the success of the agent were selected. Each blank was then graded according to the tentative scoring, and the total thus obtained was checked against the man's production record. In accordance with these results, the scoring was revised, and the same process repeated with 25 blanks selected at random. We found that those whose scores on the blank were low were also low in production, and that with increasing production the scores tended to be higher. The correlation, of course, was not a perfect one, but we were interested rather in establishing the lower critical score than in correlations. Inasmuch as the personal history blanks selected at random were well distributed into our three classes by the scoring which we had determined upon, we selected this scoring as our final method. The weighted values thus assigned to the significant items were as follows:

Age			
18-20	−2	28-29	+2
21-22	−1	30-40	+3
23-24	0	41-50	+1
25-27	+1	51-60	0
		Over 60	−1

[1] Report A—1921, Scoring of Personal History Blanks. Bureau of Personnel Research, Carnegie Institute of Technology.

Marital Status
Married +1
Single —1

Service
Full Time +2
Part Time —2

Education
8 years +1
10 years +2
12 years +3
16 years +2

Occupation
Social +1
Unsocial —1

Insurance
Carried +1
Not carried —1

Clubs
Belongs to Clubs +1
Does not Belong —1

Experience
Previous Life Insurance Experience +1

Confidence
Replies to Question: "What Amount of Insurance Are You Confident of Placing Each Month" +1
Does Not Reply —1

All of these significant items are the results of study of the personal history blanks. They do not represent guesses as to what ought to distinguish successful from unsuccessful agents, but items upon which successful and unsuccessful men actually have differed. Of course, in no single case will all these items be significant, various factors will operate in some instances to cause certain items to lose their predictive value for certain men. It is not upon any single item, however, that we will base our conclusions, but rather upon the total result from all the items.

The significance of the items may be explained as follows:

(1) *Education.* Through the high school period, schooling seems to be increasingly important to the life insurance salesman. When, however, we reach college, other factors seem to enter in to render the college man dissatisfied with this profession, and for this company, at least, the college man is not as successful as the high school graduate. It would be well here to mention the fact that the college group is a small one for this company; with a larger one our results might well be different. Even with the small group involved, there are several notable exceptions. If the college man goes into the field with the determination to succeed in life insurance salesmanship, and to make it his profession, there is no reason why, with his superior training, he should not go beyond the high school man. In the past, the difficulty has probably been chiefly one of attitude, the college man considered the field an experiment in which he might make some money while he was casting about for something to do, and

did not go in with the real desire to work, and to continue working. Hence the results in this study which is, of course, based on achievement in the past.

(2) *Age.* Up to age 40 at entry, there is a steadily increasing chance for the applicant to become a successful salesman, 30-40 being the most favorable period, inasmuch as by that time a man has amassed a large enough fund of general experience to allow him to see a situation through the eyes of a prospect and thus render the prospective buyer the best service. After age 40, he generally is too fixed in his ideas and habits to be able to make the necessary adjustments upon embarking upon a new line of work.

(3) *Occupation.* Whether an applicant has been previously engaged in an occupation in which he came in contact with people is significant as indicative of his probable success as a life insurance salesman. The fact of having worked with people, of having had to establish connections with them, renders the approach to a prospect relatively easy to the man who has been engaged in a social occupation, while to his fellow applicant who has been busied with individualistic work, it is an extremely difficult task. Examples of social occupations would be salesman, lawyer, social service worker, ex-army or navy man, etc., while of unsocial ones would be clerk, mechanic, chauffeur, etc.

(4) *Marital Status.* The married man with his increased responsibility rendering 'making good' more necessary is a better prospective agent than the single man. The man with dependents may be considered equivalent to the married man.

(5) *Insurance.* Whether the applicant carries insurance or not is significant as a factor in determining whether he will become a good agent, inasmuch as it indicates the fact that he is sold on the value of his own product. If he has not convinced himself of the value of life insurance, he is not likely to convince others.

(6) *Service.* The applicant who states that he intends to devote his full time to selling insurance is far more likely to do his utmost to make a success and to give the profession a fair trial. On the other hand, the man who makes life insurance salesmanship merely an occupation for his spare time whereby he can earn a little extra money, is not likely to become a good agent. He will be interested possibly in selling insurance, but not in seeing to it that the policy remains sold, and he is less likely, through his work, to be in himself an advertisement for his company.

(7) *Clubs.* The man who belongs to clubs and enjoys meeting others ought to be scored positively. He is more likely to be able to meet his prospects on their own ground and to sell them. This factor is closely connected with the sociability of the previous occupation.

(8) *Confidence.* The men who reply to the question "What amount of insurance are you confident of placing each month" tend to be better prospects for successful agents. Just what guess they hazard is not of importance. But the fact that they have confidence enough in their own ability to make some prophecy *is* important.

(9) *Life Insurance Experience.* Previous life insurance experience is of value to an applicant, although, of course, the reasons for his change from one company to another must be ascertained.

After the total score for each of the 502 personal history blanks had been made up, the first year's production record for each agent was secured. The blanks were then divided into three groups, (1) those who made a score below 4, (2) those who scored between 4 and 8, and (3) those who scored above 8. The lowest score actually made was —5 and the highest, 14. Each class was then divided into three parts, those whose production was below 50 units, those with a production between 50 and 100 units, and finally, those who were over 100 units. The number falling into each class was computed. The following chart indicates the results of this grouping. On the ordinate have been plotted the production units, and on the abscissa, the scores on the personal history blanks. The double line marks the critical score placed at 4.

There are 243 men who fall below 4 on the personal history blank, that is, 243 men who lie below the critical score indicated by the double line. Of the 243, 232 also fall below the minimum satisfactory production which has been placed at 50 units. Thus, of men scoring below 4, 96% are failures in production.

The cases to the right of the second vertical are agents who scored 8 or over on their blanks. Of these 68 men, 36 had a production of 50-100 units or over 100 units, and so, may be termed moderately to very successful. Therefore, of men scoring above 8 on the history blank, 53% are successful, as opposed to 4% of successes among those scoring below 4.

In between the first and second verticals are the men who made between 4 and 8 on their blanks. The results here are not as striking as in the other groups. In this division,

although 83% are failures, 17% are successes. Should other tests be given, they would probably serve to differentiate further among the agents forming this group.

Looking at the chart the other way, we find that of the 433 agents whose production was less than 50 units, or in other words, of those below the first or lower horizontal, 54% fall into the group whose score on the personal history blank is below 4. That is, this group of agents scoring below 4, the critical score, contains more failures in production than do the other two groups of those above 4 put together. If, on the other hand, we turn to the group which we may term

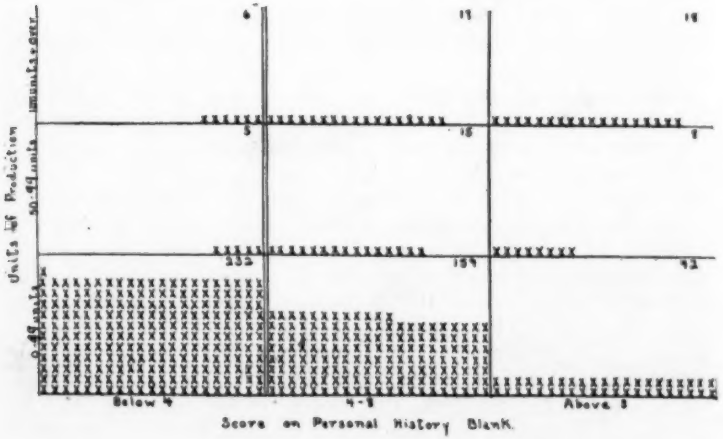


Chart Showing Relation of Personal History Score to Production Record

moderately to very successful, we find that of the 68 agents composing this group whose production is over 50 units, only 11, or 16%, will be found among those in the group scoring below 4 on the personal history blank.

It is evident then that the critical score should be set at 4. By cutting out those falling below that figure, we eliminate 54% of the subsequent failures, while 84% of the subsequent successes remain with the company. If the critical score were set higher up at 5 or 6, it is true that more failures would be eliminated, but at the same time more successes would be cut off,—an unprofitable operation.

The study of these 502 blanks has, therefore, indicated that for a life insurance company, the score on the personal history blank bears a positive relationship to the applicant's future success, and that on this blank a lower critical score may be set, below which it would not be worth while to license an applicant. The same would probably hold true for other sales forces in other occupations, but insofar as each industry presents a different problem, a different method of scoring would have to be worked out in each case.

THE SELECTION OF A SUCCESSFUL SECRETARY

A. T. POFFENBERGER, Columbia University

One of the high grade secretarial schools for women in New York City wished to try out a psychological examination as a means of selecting more competent and promising material and for raising the general standard of the school. The Army Alpha intelligence test was suggested and tried for one year. The data accumulated may be of service to the psychologist both by adding to what is already known about this examination, and also by indicating some of the difficulties that are met in applying it in such a practical situation.

The school is small enough so that each student is well known to the instructors and on that account the conditions are favorable for making estimates of fitness. Sixty-two students in the school were given the Alpha test. The school authorities supplied the following data:

1. A classification of the students into four groups as to their general school standing: Excellent, Very Good, Fair and Below the Standard of the School.

2. A classification of the students into ten groups according to their proficiency in each of their four most important studies, namely: Typewriting, Stenography, Accounting and English.

3. An order of merit arrangement according to proficiency in each of these studies.

4. A special report on certain students who were considered unsatisfactory.

Table 1 shows the coefficients of correlation (Spearman) between the order of the students in each of the four studies and in each of the eight parts of the Alpha test; also the coefficients of correlation between their order in each of the four subjects and that obtained from their total score in the Alpha test. If the ranks given for the four studies are averaged into what might be called a school rank, its correlation with the Alpha scores is represented by the coefficient +.65. Most of the correlations seem fairly large. The highest is between the test and English (+.70) and the lowest is between

the test and typing (+.46). The three coefficients in the body of the table that are lowest are those between typing and "Information" (+.11) and between accounting and "Oral Directions" (+.17) and "Practical Judgment" (+.10). The final coefficient of +.65 is about as high as has been obtained between college work and an intelligence test. One might then conclude that intelligence plays about as much part in secretarial school work as in general college work.

TABLE 1

	Oral Directions	Arithmetical Problems	Practical Judgment	Synonym-Antonym	Disarranged Sentences	No. Series Completion	Analogies	Information	Total Score
	1	2	3	4	5	6	7	8	
Typewriting	.59	.78	.45	.41	.46	.60	.62	.11	.46
Stenography	.60	.77	.39	.60	.64	.55	.66	.45	.55
Accounting	.17	.78	.10	.51	.60	.73	.40	.52	.50
English	.43	.63	.59	.71	.80	.71	.73	.63	.70

Judging from the size of the coefficients of correlation given in this table, certain of the separate parts of the Alpha examination are as effective for discovering typing and stenographic ability as are the special tests which have been tried out for that purpose. For example, the following coefficients were obtained by Rogers (unpublished) with two of his groups of skilled operators.

TABLE 2

	Typing	Stenography
Verb-object	.35	.36
Number checking	.39	.07
Color Naming	.38	.34
Agent-Action	.28	.23
Action-Agent	.26	.47
Substitution	.20	.40
Directions	.19	.46
Mixed Relations	.04	.31
Opposites	.06	.45

Without making any detailed comparison, it will be observed that most of the Alpha coefficients are higher than those in this group. It would seem to be advisable, when using the Alpha examination for testing special groups, to work with scores of the component tests as well as with the total score. Clues as to the measures of special capacity may thereby be obtained.

Table 3 gives some indication of the degree to which each of the eight parts of the Alpha examination is effective in picking the good from the poor in each of the four types of work, typing, stenography, accounting and English. The best ten and the poorest ten students in each of these subjects were selected, and their average scores in each of the eight parts of the Alpha examination were calculated. The average scores were reduced to percents of the maximum scores obtainable in the different parts, and these are given in the table. The differences between the records of the best and poorest ten are also given in the table.

TABLE 3

Per cent of Maximum Score

	Part of Alpha	1	2	3	4	5	6	7	8
Typing	Best 10	78	59	81	86	88	63	74	73
	Poorest 10	54	34	66	72	80	44	47	68
	Difference	24	25	15	14	8	19	27	5
Stenography	Best 10	81	63	79	90	96	62	80	77
	Poorest 10	68	39	70	71	75	49	48	68
	Difference	13	24	9	19	21	13	32	9
Accounting	Best 10	81	62	71	88	93	66	84	75
	Poorest 10	70	39	70	74	76	45	62	63
	Difference	11	23	1	14	17	21	22	12
English	Best 10	83	63	77	92	96	68	86	80
	Poorest 10	75	51	64	68	71	43	50	59
	Difference	8	12	13	24	25	25	36	21

The school authorities in this case were interested in establishing a minimum score for entrance into their school. They were further interested in individuals rather than in statistical results. They wanted to know how their present students whose qualities were known would have been affected by establishing a minimum Alpha score at a certain point. To answer this question the students were distributed according to their appearance in the ten groupings provided by the instructors and according to their Alpha rating expressed in steps of ten points each. Such a distribution chart was prepared for each of the four studies and for a combination of these. The results were not satisfying. If the minimum score was set at such a level as to retain the good students (Alpha score 90) it did not eliminate the unsatisfactory stu-

dents; and if set high enough to eliminate the poor students, too many of the good students were eliminated. These tables will not be reproduced, as a condensed one will serve as an illustration.

Table 4 shows the distribution of students into four classes according to their general fitness as estimated by their instructors and into eight classes according to their score in Alpha. It will be seen that no one who made a score less than 90 made a satisfactory record in the school; also that no one who

TABLE 4

Alpha Score

School Standing	50–69	70–89	90–109	110–129	130–149	150–169	170–189	190–212
Excellent					4	13	7	1
Very Good			1	1	8	5	2	
Fair			1	7	3	3		
Below School Standing		1	2	1	2			

made a score above 171 made a record in the school worse than "Very Good." If the critical score were set at 90, only one of the six unsatisfactory students would be eliminated. If it were set high enough to include half of the unsatisfactory students, then two who were satisfactory would be eliminated. To eliminate all of the six unsatisfactory students would mean the elimination of twenty-five satisfactory students.

An examination of the cases where the students stood high in school work and low in the test shows clearly the importance of other than intelligence traits. Most important of these is a genuine interest and liking for the work and next to this stand loyalty, personal appearance, manner, steadiness and other social traits, which the test does not measure. One of the two cases of relatively high intelligence and low school standing, was a woman who, previously well-to-do, was forced by circumstances to earn her livi . Lack of interest in secretarial work was obviously the difficulty here.

The writer believes that performance in an intelligence examination such as Alpha may not be an entirely adequate and economical basis for selection of secretaries any more than for mill workers and salesclerks. To choose out of all

available candidates those of the highest intelligence does not guarantee the selection of those having the character traits needed for successful secretarial work. Consideration should be given to both these aspects of the personality.

From the psychologist's point of view it might not be difficult to decide upon a critical intelligence score for the purposes of this school. For instance, a critical score of 130 would eliminate only 2 above average and 12 below average. But here as in most institutions where tests are being established the keenest interest centers upon the individual case. If one or a few good students be lost, the test may thereby be condemned. "If a man have a hundred sheep and one of them be gone astray, doth he not leave the ninety and nine, and goeth into the mountains, and seeketh that which is gone astray? And if so be that he find it, . . . he rejoiceth more of that sheep than of the ninety and nine which went not astray."

THE RELIABILITY OF JUDGMENT OF PERSONAL TRAITS

By JOHN SLAWSON, Division of Mental Defect and Delinquency, New York State Board of Charities

Two outstanding features in the science of mental measurement clearly indicate the necessity for the standardization of judgment evaluation of personal traits: (1), an unfortunate lack of objective measures for human traits other than intelligence, or educational attainment, so that evaluation of an individual in the shop, factory or school is still largely a matter of comparative judgment, such as ranking in order of merit; no contention is made that the judgment method is as desirable as the standardized scale method employed in evaluating intelligence, but since the former is used of necessity, it must be raised to as objective a level as possible; (2), in the derivation of a great many of our objective tests for intelligence and specific aptitude, we incorporate judgment evaluation in the composite criterion which determines the authenticity of these tests.

In this paper the writer intends to give a brief report of the results of a study[1] made in cooperation with the Bureau of Research of the Department of Education of the City of New York, the purpose of which was to determine the possibilities of the order of merit method in evaluating personal traits of individuals engaged in a specific profession or work. Eleven personal traits were chosen as defined below, and independent ratings were made by 31 judges distributed among six schools (5+5+4+7+6+4=31).

In each of the six schools, twenty-five teachers known to all of the judges chosen in that school were rated in the eleven traits, which were selected because of (a), supposed importance in the teaching profession, (b), competency of at least five rators to make judgments in them, and (c), distinctness or exclusiveness.[2] The judges were asked to rate the teachers

[1] The original report bearing the same title as this paper is on file at the Psychological Library of Columbia University, in manuscript form.

[2] Thorndike, E. L., "A Constant Error in Psychological Rating," *Jour. of App. Psychol.*, 1920, pp. 25-29.

in order of merit, i. e., placing the one who possessed most of the quality in question first and the one who possessed least of the quality last, by the use of the Stenquist "Cardlist" Combination Ranking Card,[3] which makes the task much less laborious to the rater and helps maintain uniformity in materials. Each judge, of course, made all ratings independently of the other judges.

	Trait	Definition
No. 1.	*APPEARANCE.*	(Personal neatness in dress, cleanliness, etc.).
No. 2.	*TACT.*	(Ability to deal with others without giving offense).
No. 3.	*PUNCTUALITY.*	(Habit of being on time).
No. 4.	*EFFORT.*	(How hard does this person try?).
No. 5.	*JUDICIAL SENSE.*	(Fairmindedness, impartiality).
No. 6.	*LEADERSHIP.*	(Ability to lead, guide, direct, influence).
No. 7.	*COOPERATIVENESS.*	(Willingness to work effectively with others).
No. 8.	*PROFESSIONAL INTEREST AND GROWTH.*	(Interest in becoming a better teacher. Professional magazines, continued courses, lectures, associations, etc.).
No. 9.	*UNDERSTANDING OF CHILDREN.*	(Insight into child nature. Success in handling children).
No. 10.	*COUNTERACTING FACTORS.*	(This calls not for a judgment of the persons being ranked, but for a judgment of the *environment* in which each is working. Rank the person who is working under the greatest handicaps, No. 1, or first; the one working under the next greatest handicaps, 2d, etc.). Counteracting factors include such things as: especially difficult classes; poor equipment; depressing relations with other teachers or with supervising staff; bad hygienic conditions; poor health, etc.—*ALL AS COMPARED WITH OTHERS OF THE GROUP BEING JUDGED.*
No. 11.	*ALL-ROUND VALUE TO SERVICE.*	(As compared with all others. Not a *total* of the other items. A single estimate in toto disregarding specific items above).

[3] Stenquist, J. L., "An Improved Form of Rating by the Order of Merit Method." *Jour. Ed. Psychol.*, Dec. 1920, p. 526.

After an interval of about two weeks, the ratings were repeated by all of the judges independently of the first ratings. Sometime after the second set of ratings were made, the judges were asked to rate the same teachers using the same method as before, in acquaintance, i. e., placing the person best known to the rator first, and the one least known last. The judges were also requested to answer a questionnaire, for the purpose of ascertaining the qualitative aspects of the data, such as the kind of criteria used in making ratings, etc. Statistical treatment of the first set of ratings the second set, the ratings in acquaintance and the answers to the questionnaire enabled the writer to answer either provisionally or definitely the following questions:

1. Which of the traits chosen lend themselves best to objective evaluation?
2. Do the traits tend to retain their positions for relative objectivity in different groups?
3. To what degree can we reduce the differences in criteria employed?
4. What is the effect of acquaintance upon variability of trustworthiness of judgment?
5. What is the relation between judicial capacity and judicial consistency?
6. What is the effect of more than one trial of a rator's judgment upon judicial agreement?
7. What is the relation between judicial capacity and official position?
8. Does the distribution of judicial capacity tend to be specific or general? These questions will be dealt with separately in brief form. For a full account of statistical treatment employed and unabridged tables reference should be made to the original manuscript.[4]

1. Relative Objectivity of Personal Traits.

The degree of objectivity of a personal trait may be determined by ascertaining the degree of group agreement, that is, the greater agreement there is among competent judges in assigning positions to subjects (independently of each other), the more objective is the trait.[5] Table I gives the average coefficients of group agreement of the eleven personal traits arranged in order of magnitude. Each average coefficient of agreement (Av. $\bar{r}_{pq}$) is the average of the average co-

[4] *Ibid.*

[5] Hollingworth, H. L., "Experimental Studies in Judgment." *Archives of Psychol.*, No. 29, pp. 116, 118.

efficients of correlation between any judge, p, and any other judge, q, in each of the six groups of judges. In other words, each of the Av. $\bar{r}_{pq's}$ in Table I is the average of 68 intercorrelations. The P. E.'s are simply the variability coefficients for the six separate groups. The $\bar{r}_{pq}$, the coefficient of agreement for each of the six groups of judges, not shown in Table I, was obtained by the use of the following formula devised by Professor T. L. Kelley, which makes possible the computation of a group correlational index directly without the need of computing the individual correlations between the judges:

$$\bar{r}_{pq} = 1 - \frac{M(2+4n)}{(M-1)(n-1)} + \frac{12\Sigma(SX)^2}{M(M-1)n(n^2-1)}$$

$\bar{r}_{pq}$ is the same as Pearson's r.

TABLE I

Final Position	Name of Trait	Av. $\bar{r}_{pq}$	P. E. (t-o)
1	All-Round Value to Service	603	.032
2	Cooperativeness	522	.013
3	Leadership	503	.031
4	Effort	491	.026
5	Understanding of Children	472	.036
6	Professional Interest & Growth	470	.027
7	Appearance	460	.016
8	Tact	453	.033
9	Punctuality	408	.040
10	Judicial Sense	335	.027
11	Counteracting Factors	251	.038

Final Position of Traits with their average coefficients of agreement and unreliabilities of these averages.

Table I shows that "All-Round Value to Service" holds first place in objectivity; it has the highest coefficient of intragroup agreement. Judging from its P. E., its position in the series of eleven is relatively secure. It is to be noted that this is a complex or composite trait; the others are elemental or specific traits. This result, i. e., the greater objectivity of a composite trait as compared with specific traits is in accord with Wells' findings in his study of literary merit.[6] "Counteracting Factors," the condition that tends to lower the efficiency of a teacher, retains the last position with about as high a

[6] Wells, F. L., "A Statistical Study of Literary Merit," *Archives of Psychol.*, No. 7, p. 14.

reliability as "All-Round Value" retains first place. "Appearance" occupies a surprisingly low position. If we consider the fact that the correlation between two intelligence tests, one verbal and one non-verbal, is about .60, we can see the significance of the first three coefficients in Table I as regards objectivity.

2. Intergroup Agreement as to Relative Objectivity.

If we examine the differences between the coefficients together with the P. E.'s in Table I, we can see at a glance that the relative positions of the traits are insecure. This is, of course, due to the lack of a high degree of agreement between the six schools as regards the relative objectivity of these personal traits. Table II illustrates this fact more clearly. Here we see that the relative positions of the traits obtained from the coefficient of agreement in each school are by no means alike in each of the schools. Traits numbered 5, 7,

TABLE II

Trait No.	Trait	Sch. I	Sch. II	Sch. III	Sch. IV	Sch. V	Sch. VI
1	Appearance	9	7	4	4.5	8	6.5
2	Tact	6	3	7	10	10	3.5
3	Punctuality	2	2	9	9	9	10
4	Effort	5	6	8	1	4	8
5	Judicial Sense	8	10	11	11	7	9
6	Leadership	3.5	9	3	6	2	5
7	Cooperativeness	3.5	5	1	4.5	5	3.5
8	Prof. Int. and Growth	10	8	2	7	3	6.5
9	Understanding of Children	7	4	10	2.5	6	1
10	Counteracting Factors	11	11	6	8	11	11
11	All-Round Value	1	1	5	2.5	1	2

Relative positions of traits obtained from the coefficients of agreements in each school (1 indicates highest $\bar{r}_{pq}$ and 11 indicates lowest $\bar{r}_{pq}$).

10 and 11 hold their positions with a fair degree of consistency in that they at least stay in either the upper or lower half of the series of eleven. The positions of the rest of the traits are quite inconsistent. Trait No. 3, "Punctuality," occupying 2d position in the first two schools and 9th and 10th positions in the last four schools, shows indications that a variable operating in Schools I and II, in a manner opposed to that in Schools III, IV, V and VI is tending to make this trait objective in the former case, and subjective in the latter.

This disagreement with respect to objectivity among apparently homogeneous groups is of practical significance, for

should the intergroup disagreement be inherent in rating by the order of merit method, local standardizations for each group would become necessary, thus greatly diminishing the usefulness of rating. The trait that would lend itself best to objective evaluation in one school of a large school system, or in one department of a large industrial organization, would not do so in another school or in another department.

3. The Question of Criteria Employed.

Although personal interpretation by the judges cannot and possibly should not be entirely eliminated, qualitative analysis of the questionnaire which was sent to the judges showed that standardization of the environmental conditions under which judgments are made and of the elements to be included in the interpretations will greatly reduce the disagreement and inconsistencies referred to above. The following are some of the more important points noted in regard to the standardization of criteria.

A. Consulting Records: in schools I and II, practically all of the judges consulted records when rating for "Punctuality," but in the other four schools only two out of 21 judges consulted records. This explains the inconsistency referred to, which tended to increase intergroup disagreement, i. e., the trait occupied a high position for objectivity where records were consulted and a low one where they were not. This factor can of course be easily either eliminated or standardized. With the trait "Professional Interest and Growth," a somewhat similar situation occurred—records of professional courses and examinations taken were consulted by some judges and not by others.

B. There was an indication that conditions were more favorable in some schools than in others for making ratings in a given trait. It became evident upon reading the questionnaire answers that certain traits had greater judicial advantage in one school than in another, because one school placed greater emphasis upon the activities involving these traits than another school. In schools II and VI where the trait "Tact" held a high position with respect to judicial agreement, we find statements characteristic of these schools only, such as, "Most teachers in this school have some executive position which makes judgment in this trait fairly easy." In the trait "Effort," some schools utilized as criteria extra-school activities, and others intra-school activities. "Counteracting Factors" suffered in practically all schools due to lack of personal acquaintance with the conditions under which the

teachers were working, and it may be for this reason that it occupies a consistently low position for group agreement. The data points quite conclusively to the fact that ratings made in a trait which is brought more vividly or prominently to the attention of raters during an entire year are subject to less intra-group disagreement than ratings made in a trait rarely brought to the attention of the raters (or playing a relatively unimportant rôle in the life of that particular school).

C. It appears that simple definitions of traits should be supplemented by specific items wherever possible, in order to reduce variability in criteria. In "Appearance," some allowed for financial condition of the persons rated; others emphasized how the wearing apparel suited the subject.

4. Effect of Acquaintance.

If we utilize the ratings made for acquaintance as heretofore described, and let

r_{1g} =the correlation between the rankings in merit given by judge I and the sum of the rankings given by the rest of the judges of his group *excluding* his own;

r_{1a} =the correlation between the rankings in merit given by judge I and his rankings in acquaintance;

r_{1g} =the correlation between the rankings in acquaintance given by judge I and the sum of the rankings in merit given by the rest of the judges of his group, *excluding* his own,

we can partial out the factor of acquaintance and get

$r_{1g.a}$ =the correlation between the rankings in merit given by judge I and the sum of the rankings given by the rest of the judges excluding his own, when acquaintance is kept constant (or when the judge in question is made equally acquainted with all the subjects rated).

By this process we determined to what extent *relative* acquaintance with the subjects rated contributed to the judge's agreement or disagreement with the rest of the judges. Does he deviate more from the group arrangement in rating the subjects whom he knows least, than in rating those subjects whom he knows most? It is impossible, due to lack of space, to give here the gains or losses when acquaintance is made constant for each of the 31 judges in each of the 11 traits. A summary is given in Table III by recording for each trait the average $r_{1g's}$, i. e., the average judicial agreement when the factor of acquaintance is untouched and the average

$r_{Ig.a's}$, i. e., the average judicial agreement when acquaintance is made constant. In the fourth column are given the differences as indicated, and in the fifth the P. E.'s of these differences. A positive difference indicates, of course, that acquaintance was a handicap or hindered judicial agreement, while a negative difference shows that relative acquaintance promoted judicial agreement, because when acquaintance was made constant (ruled out) judicial agreement was decreased.

TABLE III

Trait No.	Av. $r_{Ig.a}$	Av. $r_{Ig.a}$	Diff. ($r_{Ig.a}$-r_{Ig})	P. E. (diff.)
1	.602	.636	+.034	.026
2	.562	.583	+.021	.029
3	.558	.541	—.017	.034
4	.662	.648	—.014	.031
5	.494	.445	—.049	.034
6	.619	.583	—.036	.031
7	.642	.627	—.015	.024
8	.581	.574	—.007	.031
9	.592	.630	+.038	.036
10	.400	.385	—.015	.038
11	.661	.651	—.010	.024

Showing the influence of relative acquaintance in hindering or promoting judicial agreement in a given trait.

It will be noticed that although there are 8 negative differences, the unreliabilities are so large (exceeding the differences in 7 out of the 11 traits, and in the remaining 4 being slightly less than the differences), we can fairly safely conclude that the influence of the difference in relative degree of acquaintance on judicial agreement in situations such as were here encountered is negligible.

This inability of acquaintance to definitely either raise or lower judicial agreement becomes evident upon considering the several ways in which this factor may operate. For although lack of acquaintance with one or several subjects may result in chance ratings, thus lowering the correlation between the unacquainted judge, and the rest of the group of judges, intimate acquaintance between a rator and subjects may also lower the correlation between the intimately acquainted judge and the rest of the judges, by the exercise of prejudice either due to friendship or to the discovery of peculiarities in the subject which are particularly abhorrent to the rater (and probably unknown to the less intimately acquainted judges). The positive and negative influences would then in the long run tend to balance each other, that is, acquaintance would have little or no effect. This finding is, of course, no argument in favor of phrenology, because zero acquaintance was

eliminated before we started by choosing as judges those who had at least some acquaintance with the subjects. The discussion refers only to relative degree of acquaintance and not to a total lack. This result should also not be confused with what we said about the advantage that the familiar trait has over the non-familiar one as regards group agreement or objectivity—"trait acquaintance" is an important factor, but relative degree of personal acquaintance with subjects is not.

5. Judicial Capacity and Judicial Consistency.

Judicial capacity is determined by the degree of the judge's agreement with the competent group of judges of which he is a member.[7] Judicial consistency is determined by the degree of agreement between two or more independent ratings made by a judge.[7] No demonstrable relation was found between the former and the latter. This relation was investigated with the intention of ascertaining whether it was possible to determine capacity from consistency, since the latter can be determined so quickly and easily. The results were negative.

6. The Effect of More Than One Trial.

Contrary to expectations, we found that intercorrelating the average rank for two trials given by each judge, with the average rank for two trials given by each of the other judges did not increase group agreement or objectivity. As a matter of fact, the latter was lowered in some of the traits. In rating by order of merit, it seems that increasing the sampling of measures (ratings) does not bring us nearer the truth, i. e., increase group agreement.

7. Judicial Capacity and Official Position.

Table IV enables us to approximate roughly the relation

TABLE IV

Official Position	No.	Position for Judicial Capacity						Total for 1st 3 pos.		Total for Pos. below the third	
		1		2		3					
		No.	%	No.	%	No.	%	No.	%	No.	%
Principals	4	1	25	2	50	1	25	4	100	0	00
Assis. Principals	10	3	30	3	30	2	20	8	80	2	20
Teachers	17	2	12	1	6	3	18	6	36	11	64

Showing the relation between official position and judicial capacity.

[7] Hollingworth, H. L., op. cit., p. 109; "Vocational Psychology," pp. 158, 159, 167 (New York, Appleton, 1916).

between official position and judicial capacity. In interpreting the table the percentages of principals, assistant principals and teachers occupying the first three positions in judicial capacity should be compared with the percentages occupying positions below the third. The superiority of the prinipals and assistant principals as judges is clearly seen. The assistant principals are better judges than the teachers, and the principals are better than the assistant principals. It is, of course, unsafe to make a positive conclusion from the small number of representatives that we have in each official position, but the indications are that executives and supervisors make better judges than associates or, stated differently, there is a positive correlation between official position and judicial capacity.

8. Distribution of Judicial Capacity.

The distribution of judicial capacity for each judge was investigated by plotting the number of times every judge occupied each designated position for judicial capacity in his group. In Fig. (a) below, we see that Judge A of School I, where there were 5 judges and, therefore, 5 possible positions for judicial capacity in each of the 11 traits, occupies the 5th or last position in 10 out of the 11 traits. He is, therefore, a generally poor judge; in Fig. (b) we see a generally good judge (but not so marked as the former).

Fig. (a) Position-Judge A-School I		Fig. (b) Position-Judge C-Sch. II		Fig. (c) Position-Judge D-Sch. IV	
1st		1st	*****	1st	*
2nd		2nd	*****	2nd	***
3d		3d	*	3d	*
4th	*	4th		4th	**
5th	**********	5th		5th	**
				6th	*
				7th	*

On the other hand, in Fig. (c) we see a judge occupying every possible position in his group (there were 7 judges in this school, and, therefore, 7 possible positions), from best to poorest. Figures (a) and (b) are illustrations of general judicial capacity, and (c) illustrates specific judicial capacity. If we plotted all the graphs here for each of the 31 judges, it would be seen that, roughly speaking, figures of type (a) and (b) are predominant, indicating that there is a greater tendency toward a general distribution of judicial capacity for each judge than toward a specific distribution. There is,

however, hardly strong enough evidence to conclude that if a person is a good judge in one trait he will be an equally good judge in another trait. There is an indication that he will. This relation is somewhat similar to the one found with intelligence—the preponderance of a general distribution of intelligence over a specific distribution.

COMPUTING INTERCORRELATIONS OF TESTS ON THE ADDING MACHINE

By HERBERT A. TOOPS, Institute of Educational Research, Teachers College

Any scale lately constructed for mental, educational or vocational measurement must have both high reliability and high validity. If it is to lay claim to any particular merit, it must correlate well with a valid objective criterion, or composite variable consisting of independent, socially derived and socially acceptable, measures of the ability being tested. High validity may be secured by proper selection and scaling of the elements of the individual tests composing the scale, and by weighting the individual tests in such manner that the weighted composite shall correlate most highly with the criterion. In this latter process the intercorrelations of a number of tests are often computed. This is a strenuous task unless systematic methods are used, since, if there are n variables including the criterion, there will be $\frac{n(n-1)}{2}$ correlations to be computed. It is the purpose of this article to outline a procedure by which these can be rapidly calculated.

The procedure is based upon the formula,

$$r = \frac{N \cdot \Sigma XY - \Sigma X \cdot \Sigma Y}{\sqrt{N \cdot \Sigma X^2 - (\Sigma X)^2}\ \sqrt{N \cdot \Sigma Y^2 - (\Sigma Y)^2}} \qquad (1)$$

in which X and Y are *gross measures of transmuted scores,* as described below. The speed possible with this formula depends upon: (a) the fact that these transmuted scores are numbers which are so small in magnitude that they may be readily multiplied mentally to obtain the XY products; (b) the use of a listing adding machine, the printed record from which supplies the required sums of Formula (1). The adding machine record affords a ready check upon the correctness of the work, and legibly prints all writing ordinarily required in making tally marks, raw scores, and the like, in other methods.

TABLE I

STANDARD GROUPING TABLE FOR DETERMINING TRANSMUTED SCORES FROM RAW SCORES WHICH ARE POSITIVE IN AMOUNT AND RANGE UPWARDS FROM ZERO

Transmuted Score	Raw Scores Which Will Yield the Given Transmuted Scores of the Stub of the Table, When the Class Interval (I) is:												Transmuted Score
	1	2	3	4	5	6	7	8	9	10	11	12	
1	0	0–1	0–2	0–3	0–4	0–5	0–6	0–7	0–8	0–9	0–10	0–11	1
2	1	2–3	3–5	4–7	5–9	6–11	7–13	8–15	9–17	10–19	11–21	12–23	2
3	2	4–5	6–8	8–11	10–14	12–17	14–20	16–23	18–26	20–29	22–32	24–35	3
4	3	6–7	9–11	12–15	15–19	18–23	21–27	24–31	27–35	30–39	33–43	36–47	4
5	4	8–9	12–14	16–19	20–24	24–29	28–34	32–39	36–44	40–49	44–54	48–59	5
6	5	10–11	15–17	20–23	25–29	30–35	35–41	40–47	45–53	50–59	55–65	60–71	6
7	6	12–13	18–20	24–27	30–34	36–41	42–48	48–55	54–62	60–69	66–76	72–83	7
8	7	14–15	21–23	28–31	35–39	42–47	49–55	56–63	63–71	70–79	77–87	84–95	8
9	8	16–17	24–26	32–35	40–44	48–53	56–62	64–71	72–80	80–89	88–98	96–107	9
10	9	18–19	27–29	36–39	45–49	54–59	63–69	72–79	81–89	90–99	99–109	108–119	10
11	10	20–21	30–32	40–43	50–54	60–65	70–76	80–87	90–98	100–109	110–120	120–131	11
12	11	22–23	33–35	44–47	55–59	66–71	77–83	88–95	99–107	110–119	121–131	132–143	12
13	12	24–25	36–38	48–51	60–64	72–77	84–90	96–103	108–116	120–129	132–142	144–155	13
14	13	26–27	39–41	52–55	65–69	78–83	91–97	104–111	117–125	130–139	143–153	156–167	14
15	14	28–29	42–44	56–59	70–74	84–89	98–104	112–119	126–134	140–149	154–164	168–179	15
16	15	30–31	45–47	60–63	75–79	90–95	105–111	120–127	135–143	150–159	165–175	180–191	16
17	16	32–33	48–50	64–67	80–84	96–101	112–118	128–135	144–152	160–169	176–186	192–203	17
18	17	34–35	51–53	68–71	85–89	102–107	119–125	136–143	153–161	170–179	187–197	204–215	18
19	18	36–37	54–56	72–75	90–94	108–113	126–132	144–151	162–170	180–189	198–208	216–227	19
20	19	38–39	57–59	76–79	95–99	114–119	133–139	152–159	171–179	190–199	209–219	228–239	20

Directions:—Determine the range of the variable under consideration. Range=(highest score—lowest score + 1). Divide the range by 20, and *raise* the decimal of the quotient to the next higher integer for the class interval. Using the column of raw scores corresponding to that class interval in the heading, locate in the left or right margin the transmuted scores corresponding to the gross scores of the several subjects in the variable under consideration.

Example: (1). An age group ranges from 18 to 58. Range=(58—18+1)=41. Class interval=41/20=3. Use column I=3 for transmuting these ages into smaller classes.

Example: (2). The scores on a test range from 0 to 35. Range=(35—0+1)=36. Class interval=36/20=2. Use column I=2 for transmuting these scores into smaller classes.

The steps in order are as follows:

1. Tabulate the crude gross scores on the different tests in parallel columns, with a given subject's scores all on the same horizontal row, A, Fig. 1.

2. Determine the range of crude gross scores in each test. The range of a variable=(highest score made in the variable minus the lowest score made in the variable plus 1).

Now, for each test divide the range, thus determined, by 20, and raise the quotient to the next higher integer. This quotient will be the class interval, I, which indicates for a given variable which column of the Standard Grouping Table (Table 1) is to be used in transmuting the crude gross scores to class scores. These transmuted class scores are the classes under which a given crude score would be tabulated if grouped and tabulated into not over twenty classes. This rule for determining I, examples of which are given in footnotes to Table 1[1] insures that there will be *as many classes as possible*

[1] In practice, Table 1 is made out for the variables under consideration; that is, *Table 1 fits only those tests where zero scores occur.* Thus for Test 11, with no zero scores, but raw scores ranging from 41 to 82, say, the total range is 42; and 42/20 gives I = 3. In this case, one would not use the I = 3 column of Table 1, but would construct a table:

"Grouping Table for Test 11 only, I = 3.

Transmuted Score	Raw Score
1	39-41
2	42-44
3	45-47
4	48-50
..	.... "

As a desirable convention, the columns of raw scores should always begin with a multiple of the class interval as above and as in Table 1.

The above table insures that the *maximum number of classes* will result. It is evident that the (I = 3)-column of Table 1 cannot be used since it does not go high enough to contain the maximum score on Test 11.

Again, the crude scores on Test 19 range from 32 to 59. Here it would be *possible* to use I = 3 column of Table 1, but this would give *only ten* classes. Here I = 2, and the table to be constructed is:

"Grouping Table for Test 19 only, I = 2

Transmuted Score	Raw Score
1	32-33
2	34-35
3	36-37
4	38-39
..	.... "

with the restriction that there shall be *not more than twenty* classes.

3. From Table 1, make out a cardboard stencil card (B. Fig. 1), of gross scores and transmuted classes for the variables as shown. A shows only the first three cases of the original data sheet; B shows only the first five of the total twenty lines of the stencil card; while C shows the transmuted scores of the three names of A, and one additional name. Note that the column spacings of B and C correspond

Crude Scores in Variable No.

A. Crude Data

Name	1	2	3	4	5	6	7	
Aloe, John..	8	4	8	7	7	25	5	
Beatty, Ray	14	17	52	13	15	79	28	
Cole, Henry	10	6	14	3	8	23	20	

B. Cardboard Transmutation Table

	I=2	I=1	I=3	I=1	I=2	I=5	I=2	
Class 1	0–1	0	0–2	0	0–1	0–4	0–1	Class 1
2	2–3	1	3–5	1	2–3	5–9	2–3	2
3	4–5	2	6–8	2	4–5	10–14	4–5	3
4	6–7	3	9–11	3	6–7	15–19	6–7	4
5	8–9	4	12–14	4	8–9	20–24	8–9	5

Transmuted Class Scores in Variable No.

C. Typewritten Transmuted Data

Name	1	2	3	4	5	6	7	
Aloe, John..	5	5	3	8	4	6	3	
Beatty, Ray.	8	18	18	14	8	16	15	
Cole, Henry.	6	7	5	4	5	5	11	
Dorsey, Tom	7	11	10	6	3	9	8	

Figure 1. Showing relative positions of Crude Data Sheet, Transmutation Table, and Transmuted Data Sheet in obtaining the transmuted scores. *A* is the crude data, large scores. *B* is the transmutation table. in which the columns are taken from the standard grouping table according to the range of the variable in the respective columns. *C* is the transmuted data sheet, on which the largest possible gross score is 20.

with A. In A, it is assumed that the range of variables is such that the class intervals are: $I_1=2$; $I_2=1$; $I_3=3$; $I_4=1$; $I_5=2$; $I_6=5$; $I_7=2$; and these columns are taken from the corresponding columns of Table 1 in constructing the stencil card transmutation table, B.

4. Lay B upon A, allowing "Aloe, John" scores only to be visible. The transmuted scores are read from B, variable by variable, and either copied directly beneath on the transmuted data sheet, C, or else read to an assistant who copies them onto the transmuted data sheet, C. Note that "Aloe, John" score of 8 on Variable 1, is found in the same column of B in the 8-9 group, and means a transmuted class score of 5; that his score of 4 on Variable 2, is found directly beneath on B to mean a transmuted class score of 5, etc.

5. Have an assistant independently make the transmutation, and thus check the correctness of C.

6. Typewrite C, making *two* carbon copies, in addition to the original typed copy, using relatively new carbon paper so that the carbon copies will be clear and distinct. Type the variable numbers as headings of the columns. *After each third name allow an extra blank horizontal row.*

7. Proofread C, making corrections of any errors on the carbon copies also.

8. Add up each of the several n columns on the listing adding machine imitating exactly the spacing of C, i. e., leaving a blank *after every third* entry. Label each column carefully with the variable number.

9. Check the work by placing the adding machine slip alongside the corresponding column of C. It will be found that the typewriter and adding machine, having the same size platens, or feed rolls, make the same spacings; hence *corresponding entries will be in opposition throughout* and may be readily checked. The adding machine sum 5 at the feet of the columns, if the work has been correctly performed, will be the ΣX's or the ΣY's of the formula, since the terms X and Y are merely relative. There will be n such columns.

10. Mentally compute the *squares of the entries* of C and enter them into the adding machine in groups of three followed by a space. There will be n such columns. Label each column carefully with the variable number squared, thus, $(1)^2$ $(2)^2$, etc.

11. Have an assistant check the squares after the manner

of procedure 9 above. The correct sums at the feet of the columns are the ΣX^2's, or the ΣY^2's.

12. Cut up both carbon copies of C into vertical columns, one variable to a column strip.

13. Place carbon strip, *n*, against variables n-1, n-2, n-3, ...1 of original typed C in turn, obtaining for each an adding machine record of the XY products in groups of three entries and a space. Then place the (n-1) carbon strip against the n-2, n-3, ...1 columns of C in turn in similar manner; and so on until *every column has been paired with every other column*. The multiplications can be done mentally in most cases. The largest possible product is 20x20=400. A simple multiplication table, constructed by the author, enables one at a glance to note any desired product not remembered, without the inaccuracies attendant upon coordinate locating, which is the fault of most multiplication tables. There are $\frac{n(n-1)}{2}$ such column multiplications. Label each slip carefully with the product of the two variables concerned; thus, (1)x(2), (1)x(3), (1)x(4), etc.

14. Have an assistant check the multiplications using the second carbon sheet strips. This work may proceed at the same time that the adding machine records are being made.

15. All the needed quantities are now known for substituting $\frac{n(n-1)}{2}$ times in formula (1) to obtain the several $\frac{n(n-1)}{2}$ intercorrelations. This may probably best be done in systematic form as shown in Figure 2. In this table,

15(a). The first entry of six in each large compartment is the ΣXY product derived from the checked adding machine records of procedure 14, for the variables at the intersection of whose coordinates the compartment is located. Notice that *these entries check for symmetry* in rows and columns about the diagonals.

15(b). The second entry of a large compartment is $N\cdot\Sigma XY$. A calculating machine may be used to multiply all ΣXY product-sums of the entire table in turn by the constant multiplier, N.

15(c). The third entry of a compartment is $\Sigma X\cdot\Sigma Y$, for the compartment con idered; i. e., the ΣX and ΣY which are coordinates of the column and row respectively in which a given compartment is located. (The ΣX, ΣY, and ΣX^2 quanti-

ties may be written into their appropriate places in procedure 15a.) These products check for symmetry of rows and columns about the diagonals.

FIG. 2

The Systematic Solution of Equation 1 in a Table of Intercorrelations.
N= 81 persons. Variable 1 is a criterion of general business ability; variables 9, 11, 13 are tests.

	$\Sigma X \longrightarrow$		904	818	1096	622	
	ΣY	Variable No.	I*	9	11	13	$1/\sqrt{K}=1/\sqrt{H}$
	904	I	1.0000	$\Sigma XY=$ 9390 $N\cdot\Sigma XY=$760590 $\Sigma X\cdot\Sigma Y$=739472 $L=$ 21118 $L\cdot\frac{1}{\sqrt{K}}$=94.0148 r=.3811	12391 1003671 990784 12887 57.3714 .3244	7156 579636 562288 17348 77.2312 .3409	.0044518815
	818	9	9390 760590 739472 21118 85.6110 .3811	1.0000	11185 905985 896528 9457 38.3381 .2168	6363 515403 508796 6607 26.7844 .1182	.0040539357
	1096	11	12391 1003671 990784 12887 72.8649 .3244	11185 905985 896528 9457 53.4712 .2168	1.0000	8553 692793 681712 11081 62.6535 .2766	.0056541408
	622	13	7156 579636 562288 17348 76.5739 .3409	6363 515403 508796 6607 29.1632 .1182	8553 692793 681712 11081 48.9114 .2766	1.0000	.0044139895
A	ΣX^2		=10712	9012	15216	5410	
B	$N\cdot\Sigma X^2$		=867672	729972	1232496	438210	
C	$(\Sigma X)^2$		=817216	669124	1201216	386884	
D	$H=K=N\cdot\Sigma X^2 -(\Sigma X)^2$		=50456	60848	31280	51326	
E	$\sqrt{H}=\sqrt{K}=$		224.62413	246.67387	176.86153	226.55242	
F	$1/\sqrt{H}=$		.0044518815	.0040539357	.0056541408	.0044139895	

Row 1 of each compartment is ΣXY
Row 2 of each compartment is $N\cdot\Sigma XY$
Row 3 of each compartment is $\Sigma X\cdot\Sigma Y$
Row 4 of each compartment is $N\cdot\Sigma XY-\Sigma X\cdot\Sigma Y=L$
Row 5 of each compartment is $L\cdot 1/\sqrt{K}$
Row 6 of each compartment is $L\cdot 1/\sqrt{K}\cdot 1/\sqrt{H}=r$

*NOTE: Do not confuse this I (criterion variable) with I (class interval) of Table 1 and of formula (4).

15(d). The fourth entry of a large compartment is the second entry minus the third, or $N\cdot\Sigma XY-\Sigma X\cdot\Sigma Y$; that is, the numerator of the correlation coefficient whose solution is being sought in that compartment. These remainders also check for symmetry of rows and columns about the diagonals.

15(e). The next step is the simplification of the denominators, which is done in the last six horizontal rows of the table.

(A). The first of these six entries is ΣX^2 obtained from procedure 11.

(B). The second row is $N \cdot \Sigma X^2$.

(C). The third is $(\Sigma X)^2$, obtained by squaring ΣX of the same column, found at the top of the page.

(D). The fourth is (B)—(C); or, $N \cdot \Sigma X^2 - (\Sigma X)^2$.

(E). The fifth is the square root of (D).

(F). The sixth is the reciprocal of (E), or

$$1/\sqrt{N \cdot \Sigma X^2 - (\Sigma X)^2}.$$

These reciprocals allow one to solve Formula 1, by a multiplication process (where a calculating machine is available). Thus, r is equal to the simplified numerator (an integral number derived in 15d) divided by the square root of the product of the simplified denominators of the two variables concerned (derived in 15(e) (D); r is likewise equal to the simplified numerator, L, times the 15(e) (F) reciprocal of X times the 15(e) (F) reciprocal of Y. If we let:

L=simplified integral numerator of 15(d) procedure;

H=simplified integral denominator expression of the X-variable in the 15(e) (D) procedure;

K=simplified integral denominator expression of the Y-variable in the 15(e) (D) procedure.

$1/\sqrt{H}$ and $1/\sqrt{K}$=the results of 15(e) (F) procedure for the X and Y variables respectively, entering into a given correlation r_{xy}.

Then, $$r^{xy} = \frac{L}{\sqrt{H}\,\sqrt{K}} = \frac{L}{\sqrt{H \cdot K}} \qquad (2)$$

in which L, and H and K and $H \cdot K$ are *all integral quantities*, the solution of the equation being readily performed on a slide rule.

Or, by the second procedure, with a calculating machine,

$$r_{xy} = \frac{L}{\quad} \quad \frac{x\ 1}{\sqrt{H}} \quad \frac{x\ 1}{\sqrt{K}}$$

in which L is an integral number and

$\frac{1}{\sqrt{H}}$ and $\frac{1}{\sqrt{K}}$ are decimal multipliers, as shown in Fig. 2.

15(f). Assuming a calculating machine available so that the solution may be effected by Formula (3), the results of procedure 15(e) (F) are now to be written on the right hand side of the chart, noting that like reciprocals belong to the same variable numbers. (In all this work, it is to be remem-

bered that the terms X and Y are purely relative; that is, that in the correlation r_{12}, variable 1 is X and variable 2 is Y; in the correlation r_{23}, variable 2 is X and variable 3 is Y; or that, finally, X is synonymous with "variable of the two mentioned first" while Y is synonymous with "variable of the two mentioned last." It follows that $\Sigma X_1 = \Sigma Y_1$, $\Sigma X_1^2 = \Sigma Y_1^2$, $H_1 = K_1$, etc.)

15(g). Now multiply the fourth entry of each large compartment in each given row by the 15(e) (F) entry at the end of the respective *rows*. On a calculating machine this 15(e) (F) entry, $1/\sqrt{K}$, is a constant multiplier for all compartments of a given row. These products do not check for symmetry.

15(h). Multiply *in columns*, each fifth entry of a large compartment by the 15(e) (F) entry, $1/\sqrt{H}$, at the foot of the respective columns. The result is r. This $1/\sqrt{H}$ entry is a constant multiplier for all compartments of a given column. The products must check for symmetry of rows and columns about the diagonals.

With a calculating machine one may omit recording procedures 15(b) and 15(c), and 15(e) (B) and 15(e) (C) and arrive directly at the integral quantities of procedures 15(d) and 15(e) (D). If accuracy of r to not more than three decimal places is required, one may omit 15(e) (E) and 15(e) (F); in that case, the correlation coefficient is given by formula (2), which is solved by slide rule.

It will be noted that 15(d) is the simplified numerator, *in integral numbers;* and that 15(e) (D) is the simplified denominator *in integral numbers* for a given correlation.

In the work of procedures 13 and 14, the carbon slips may be held in proper place by thumb-tacking sheet C and carbon slip to a soft pine work board. It will be found that the grouping of records in groups of three's will very greatly facilitate checking, eliminate checking errors, and relieve eye strain.

The numerous checks for symmetry in the solution of equation (1) in procedure 15 using Fig. 2 table, will be found to be a very adequate check on the solution of the equation. The final r's, if the work is correctly done, will check for signs, decimals and absolute magnitude. The subtractions in procedure 15 (d) are algebraic; consequently r automatically comes out with the right sign if the work is done correctly.

With this method, the author's best record thus far is the production of the XY product sums of 20 correlations of 151

cases each in an average time of 6 minutes 23 seconds each. The checking showed 3 entries of the 3020 XY entries to be in error. These were readily detected and corrected. It should be noted by way of caution that even a slight error in ΣXY will make a large error in r; with reasonable care, and a possible rechecking of the adding machine slips, no errors should escape. The computation speed outweighs the consideration that a possible error will absolutely invalidate a given r; *statistical work should be accurate.* The computation of the XY products for N=50 persons will take a little more than 2 minutes per correlation; for N=75, a little more than 3 minutes, etc. Not so much time is required for checking; and finally, the systematic tabular form of solution of equation (1) is done more rapidly and with fewer errors than in any other method of solution; any errors in the solution of the equation will be located by the symmetry check as it is highly improbable that two errors will be made and of such an amount that the final r's would check. If $r_{14} \neq r_{41}$, and if $r_{15} \neq r_{51}$, the errors may be quickly detected.

The greater the number of variables, the greater the saving in time effected by this method, as will be seen from the following tabulation of the total number of adding machine records needed, and the number of adding machine records per intercorrelation for n=2, n=3, etc., variables, as n grows larger.

TABLE 2

Table Showing the Total Number of Adding Machine Records Required, the Number of Intercorrelations Resulting, and the Number of Records per Intercorrelation, as the Number of Variables, n, Increases

n	Total No. of Records $= \frac{n^2+3n}{2}$	No. of Intercorrelations $= \frac{n(n-1)}{2}$	No. of Records per Intercorrelation $= \frac{n+3}{n-1}$
2	5	1	5.0
3	9	3	3.0
4	14	6	2.3
5	20	10	2.0
6	27	15	1.8
7	35	21	1.7
8	44	28	1.6
9	54	36	1.5
10	65	45	1.4

The fourteen adding machine printed records required for 4 variables are shown in Table 3. Remember that the first four columns are adding machine duplications of the same

columns in Table C, which was previously derived from larger gross crude scores. None of the records of Table 3 are ever written down longhand, being instead always computed mentally or by simple multiplication table up to products of 20x20, and entered directly into the adding machine. This gains speed over the slow writing of the human machine and secures legibility as well. All multiplications up to 15x15 may be easily memorized; beyond this point a simple multiplication table will refresh the memory for products up to 20x20. Every test worker knows most of the squares up to $(20)^2$.

It remains yet to be pointed out how the true averages and standard deviations may be derived.

The standard deviation presents no problem.

The formulae are:

$$\sigma_X = \frac{I_X \sqrt{H}}{N} = \frac{I_X \sqrt{N\Sigma X^2 - (\Sigma X)^2}}{N} \qquad (4)$$

$$\sigma_Y = \frac{I_Y \sqrt{K}}{N} = \frac{I_Y \sqrt{N\Sigma Y^2 - (\Sigma Y)}}{N} \qquad (4a)$$

In which I is the class interval, determined in Procedure 2, and H and K have already been determined in Procedure 15(e) (D).

The averages present a little more difficulty. The formulae for the averages, *in terms of transmuted class scores,* are:

$$M_x = \frac{\Sigma X}{N} \qquad (5)$$

$$M_y = \frac{\Sigma Y}{N} \qquad (5a)$$

These must now be located with reference to the *raw* scores. Suppose that by formula (5), $M_x = 3.47$ when the class interval of variable X is, $I_x = 3$. Our problem is thus to interpolate, in Table 1 in the (I=3)—column, a *transmuted class score* of 3.47 *into a raw* score. Now the *third* transmuted class is 6-8 in terms of raw scores, the *face value* of the class being 7.0.* We thus know that the *raw score* average is somewhat more than 7.0; it is really 47/100 of a class interval more than 7.0. Now, $(.47)(3) = 1.41$. And $7.0 + 1.41 = 8.41 = M_x$, in terms of *raw scores.*

Again, if by formula (5a), $M_y = 9.80$, when $I_y = 4$; then, M_y, in the terms of *raw scores,* $= 33.5 + (.80)4 = 36.7$.

The values of r obtained by this method are the identical values of r which would be derived from Fig. 1, C table, or from any exact method wherein the raw scores are grouped into coarser classes. By the procedure used in determining I, the grouping error of r, inherent in all grouping methods, will seldom, if ever, be more than one per cent of the magnitude of the correlation coefficient, since the coarsest possible grouping, by the schema here presented, is in the case of a range of 21, in which the gross score of 20 becomes the

TABLE 3

The 14 Adding Machine Records Required in the Solution of the 6 Intercorrelations of 4 Variables.
(Columns 1, 2, 3, 4 are copied directly from the transmuted class scores, Fig. 1, C. Each column of this table represents a separate adding machine record.)

Person	X_1	X_2	X_3	X_4	X_1^2	X_2^2	X_3^2	X_4^2	X_1X_2	X_1X_3	X_1X_4	X_2X_3	X_2X_4	X_3X_4
A	1	3	2	1	1	9	4	1	3	2	1	6	3	2
B	3	2	5	2	9	4	25	4	6	15	6	10	4	10
C	8	12	9	5	64	144	81	25	96	72	40	108	60	45
D	4	3	6	8	16	9	36	64	12	24	32	18	24	48
E	6	7	8	8	36	49	64	64	42	48	48	56	56	64
F	9	8	10	9	81	64	100	81	72	90	81	80	72	90
G	12	10	8	6	144	100	64	36	120	96	72	80	60	48
H	10	11	12	10	100	121	144	100	110	120	100	132	110	120
I	13	12	10	9	169	144	100	81	156	130	117	120	108	90
J	8	6	10	11	64	36	100	121	48	80	88	60	66	110
Sum	74	74	80	69	684	680	718	577	665	677	585	670	563	627
Notation	ΣX_1	ΣX_2	ΣX_3	ΣX_4	ΣX_1^2	ΣX_2^2	ΣX_3^2	ΣX_4^2	ΣX_1X_2	ΣX_1X_3	ΣX_1X_4	ΣX_2X_3	ΣX_2X_4	ΣX_3X_4

eleventh class. Since the correction, due to coarseness of grouping, becomes negligible if at least twelve classes are used, it will be seen that the denominator, 20, used in determining the class intervals, is a happy compromise between ease of mental multiplication and requirements for disregarding the grouping error involved by this method. The grouping errors in the use of this method may be entirely disregarded.

NOTE.—There are two current usages with respect to the face value of a class, 6-8. The first is that advocated by Pearson, involving the

determination that a score, 6, *is closer to* 6 than to any other value. Consequently the class, 6-8, will include all gross scores of 5.500 up to and inclusive of 8.499; whereupon the face value of the class is $\frac{5.500 + 8.499}{2} = 7.0$. The second usage, growing out of the test consideration that one cannot obtain a test score of 6 unless his ability is *at least* 6, considers the class, 6-8, to extend from 6.000 to 8.999, whereupon the face value of the class is $\frac{6.000 + 8.999}{2} = 7.5$. It is essential to note that people advocating the latter procedure, when finding the average of a number of test scores *without grouping* are likely to add all together on the adding machine and divide by N without thinking to add the correction of ½; when this error is made, the implicit assumption is of course that a score of 6 is *nearer* 6 than any other figure, and this procedure is the first method referred to above. Consequently many errors occur in the second method. Inasmuch as the test units are not absolute measures from a stationary zero, such as the units of a yardstick, no possible good can come from adding the ½ gross score correction, and confusion is the only likely outcome of the introduction of a procedure which is not universally applicable to statistics in other fields of research.

As a desirable convention, the lowest class of a contingency table might always be given in the form of the extreme limits classifiable in that class, after the fashion of some of the English writers. The face value of any given class can always be easily determined by taking one-half of the sum of its two extreme limits.

A GLIMPSE OF HIGH SCHOOL COURSES AS MEASURED BY THE OTIS TEST

By Ruth Swan Clark, Ph. D., Bureau of Vocational Service for Juniors, New York City

Feeling the demands of modern industrial and social conditions, High Schools of today are offering special courses of study in order to train their students for various kinds of vocations. It is important to study, not only the subjects taught in these different courses to meet these industrial demands, but also to study the students who voluntarily choose to take these courses, for the purpose of discovering whether or not they show distinguishing mental characteristics.

It is with this problem in mind that the present survey has been made. The Otis Group Intelligence Test, Advanced, was given to students in both the entering and graduating classes of various High School Courses in New York City. In this way, studies were made not only of the students who voluntarily selected these courses, but also of those who were successful in meeting the demands of the courses, so that they were allowed to graduate. The High School courses which were chosen for this survey were the Academic, the Commercial, the Technical, the Industrial Arts, and the Dressmaking.

The outstanding mental traits of the High School student of the Academic Course, so far as these could be detected by the use of the group intelligence test, are given in the following table:

The above facts indicate that the students who voluntarily chose the High School Academic Course were those of a general intelligence above the average for boys and girls of their own age. The range of intelligence within the group, however, was broad, so that one out of every 20 of these students were below the average, while nearly two-thirds of the whole class were above the average. These students were, moreover, accurate workers, having more than two-thirds of the work that they attempted correct. They also showed the ability to readily solve problems dealing with concrete situations. This ability was outstanding as compared with their memory for words in logical sequence.

TABLE 1

High School Academic Course. (Boys and Girls)

	1st Term	8th Term
[1]No. of Students	304	151
Av. Otis Score	129.9	166.3
[2]Av. Physical Age	14–2	16–0
[3]Av. Mental Age	16–4	18–4
[4]Av. Intelligence Quotient	115.2	114.5
Middle 50% Range of I. Q.	98–124	110–118
Speed (% of Questions Answered)	75.7%	77.4%
Accuracy (% of Questions Correct)	70.2%	79.9%
[5]Distinguishing Best Test	Arithmetic	Analogies
Distinguishing Poorest Test	Memory	Memory
No. of Students with Intelligence above average (I.Q.+110)	63.1%	79.4%
No. of Students with Intelligence below Average (I.Q. –90)	5.5%	.66%

The graduates of this course were of similar intelligence. The group was, however, more homogeneous; those with intelligence below the average were not with those who had completed the demands of the course. In fact, four-fifths of the class were of intelligenc above the average for those of their age. The graduates were also more accurate workers, as compared with the entering students. Their memories again showed poorly in comparison with their other mental traits. In the case of the graduates, however, their ability to perceive relationships was superior to their ability to solve problems of a concrete nature. In general it may be said that this academic course adapted itself to students of a general intelligence above the average. A student with intelligence below the average would have but one chance in 150 to graduate, while the student of average intelligence would have one chance in 5. The correlation between the intelligence quotients of these graduates and the average of their school marks

[1] This number represents the total number of students enrolled in the course.

[2] The highest physical age credited to a student was 16 years.

[3] This average was secured from the average score of the group translated into terms of the Binet Mental Age, as given in Otis Manual of Directions, 1921.

[4] This quotient was secured by dividing the average mental age by the average physical age.

[5] The "Best" and "Poorest" Tests were determined by a study of the number of errors as compared with the number of right answers in each test of each student. These tests were then arranged in order of their ease and difficulty for all students in all courses. Any deviation in this order shown by the students in any one course was considered a "distinguishing best" or "poorest" test.

for the four years was .43 (.04 P. E.) (Pearson). This is not a high correlation, but in relation to similar correlations with the students in the other courses, it is the highest of all.[1]

A similar study of the students of the Commercial Course shows the following facts:

TABLE II

High School Commercial Course. (Boys and Girls)

	1st Term	[2]6th Term
No. of Students	287	102
Av. Otis Score	119.1	147.9
Av. Physical Age	14–2	15–11
Av. Mental Age	15–7	17–5
Av. Intelligence Quotient	110.	109.4
Middle 50% Range of I.Q.	98–117	103–114
Speed (% of Questions Answered)	75.8%	80.7%
Accuracy (% of Questions Correct)	64.4%	75.1%
Distinguishing Best Test	Memory	Proverbs
Distinguishing Poorest Test	Fol. Directions	Simi-larities
No. of Students with Intelligence above Average (I.Q. +110)	43.2%	45%
No. of Students with Intelligence below Average (I.Q. –90)	11.4%	2.9%

From the above facts, it appears that those who voluntarily chose the Commercial Course were students of high average intelligence. They were rapid in their work without being very accurate. They showed a better memory for words in logical sequence than the ability to adapt themselves to the following of directions of a specific nature. Those who graduated from this course, on the other hand, were quicker, more accurate, and more intelligent. It is true that the average intelligence of the graduating class was the same as that of the entering class, but there were fewer of those with average and less than average intelligence amongst the graduates than amongst those who were entering the course. It is interesting to note also that the graduates of this course showed more conspicuously their ability to grasp and to deal with meanings of words, as in the Proverbs Test, than they did their ability in memory: the trait which characterized the entering group. The correlation between the intelligence quotients of the graduates in this course and their average marks for their three years of work was .34 (.06 P. E.). This seems to indi-

[1] Cf. Proctor, W. M. Psych. Tests and Guidance of H. S. Pupils. *Jour. of Ed. Research*, Mon. I, 1921, p. 16.

[2] This course was for three years only.

cate that not as much dependence is placed in this course upon general intelligence, as in the Academic Course.[1]

The following table shows similar mental traits for the students in a Technical High School Course:

TABLE III

Technical High School Course. (Boys)

	1st Term	8th Term
[2]No. of Students	100	100
Av. Otis Score	121.9	147.3
Av. Physical Age	14–3	16–0
Av. Mental Age	15–8	17–5
Av. Intelligence Quotient	110.	108.9
Middle 50% Range of I.Q.	102–121	102–114
Speed (% of Questions Answered)	71.1%	77.3%
Accuracy (% If Questions Correct)	70.2%	78. %
Distinguishing Best Test	Opposites	Arithmetic
Distinguishing Poorest Test	Geometric Figures	Similarities.
No. of Students with Intelligence above Average (I.Q. +110)	50.9%	44.4%
No. of Students with Intelligence below Average (I.Q. -90)	10.5%	2. %

The boys who were just beginning this technical course seem to have been those of high average intelligence, not as quick in answering the questions as those of the Academic and Commercial Courses, but resembling the students of the Academic Course in their high degree of accuracy. They were conspicuous in their ability to note logical relations, as in the Opposites Test, but they less readily adapted themselves to following the detailed directions of the Geometric Figure Test. The graduates of this course were of similar intelligence, but were quicker and more accurate in their work. They showed themselves better able to deal with arithmetic problems, which were concerned with concrete situations, than with the forming of abstractions, which were called for in the Similarities Test. The correlation between the intelligence quotients of these graduates and their average school marks for the four years was .34 (.07 P. E.). This correlation resembles that found for the students of the Commercial Course more than that found for those of the Academic Course.

[1] Cf. Bock, W. F., Intelligence of High School Seniors, p. 145. Madsen, I. N., Group Intelligence Tests as a means of prognosis in High School. J. of Ed. Research, III., pp. 43-52; 396-398.

[2] Not all the entering and graduating students enrolled in these classes were tested. Instead, 100 students taken at random from each group were used to represent them.

In Table IV are found the measurement of the same traits for the students of an Industrial Arts Course.

TABLE IV

High School Industrial Arts Course. (Girls)

	1st Term	6th Term
No. of Students	110	34
Av. Otis Score	125.8	132.7
Av. Physical Age	14–8	16–0
Av. Mental Age	16–0	16–6
Av. Intelligence Quotient	109.1	103.1
Middle 50% Range of I.Q.	99–117	97–108
Speed (% of Questions Answered)	74.7%	75.6%
Accuracy (% of Questions Correct)	68.9%	71.9%
Distinguishing Best Test	Memory	Proverbs
Distinguishing Poorest Test	Analogies	Arithmetic
No. of Students with Intelligence above Average (I.Q. +110)	44%	20.5%
No. of Students with Intelligence below Average (I.Q. –90)	6.4%	8.8%

The students entering this Industrial Arts Course resemble more the students of the Commercial Course than those of the other courses. They are of high average intelligence, quick at their work without being especially accurate, and showing an ability in their memory for words in logical sequence. Their "poorest" test, however, was different. The students of the Industrial Arts course were less apt in perceiving relationships as such (Analogies Test) than they were to follow specific directions, which was the greater difficulty for the Commercial Course students.

In comparison with the students just beginning the Industrial Arts Course, the graduates of this course showed a similar speed in their work, but they were a little more accurate. As a group, they showed less general intelligence. This may be due to the fact that more intelligent students find the course progressing too slowly for them, or it may mean that the course adapts itself more to students with a special ability in art than to students with merely a general intelligence. The correlation between the intelligence quotients of these graduates and the average of their school marks, .36 (.10 P. E.), shows as close a relationship between intelligence and success in the course as has been shown in both the Commercial and Technical Courses. However, the size of the Probable Error of the correlation shows its unreliability.

The mental traits of the students of the Dressmaking Course are given in the following table:

TABLE V.

High School Dressmaking Course. (Girls)

	1st Term	6th Term
No. of Students	110	51
Av. Otis Score	109.6	119.8
Av. Physical Age	14–7	16–0
Av. Mental Age	14–9	15–7
Av. Intelligence Quotient	101.1	97.4
Middle 50% Range of I.Q.	91–119	91–102
Speed (% of Questions Answered)	70.5%	69.4%
Accuracy (% of Questions Correct)	63.6%	70.7%
Distinguishing Best Test	Following Directions	Arithmetic Analogies
Distinguishing Poorest Test	Geometric Figures	
No. of Students of Intelligence above Average (I.Q. +110)	26.3%	11.7%
No. of Students of Intelligence below Average (I.Q. -90)	22.7%	21.5%

The girls voluntarily choosing this course in dressmaking were those of average intelligence. They were not as quick as the Commercial Course students but they showed the same degree of accuracy. Unlike the Commercial Course student, however, they displayed more ability in following directions accurately. They resembled the Technical Course students in the difficulty they found with the Geometrical Figure Test.

The graduates of this course were also of average intelligence. This group was, however, a more homogeneous one, for the entering students included many students of intelligence above the average for those of their age, while these did not appear amongst the graduates to such an extent. Again one might conclude that the course did not progress fast enough for students of higher general intelligence, or that the course adapted itself more to students with a special ability in hand work than to students with merely a general intelligence. The correlation between the intelligence quotients of these graduates and the average of their school marks for the three years was .35 (.06 P. E.). This correlation indicates as close a relationship between intelligence and success in the course as has been pointed out in the Commercial, the Technical, and the Industrial Arts Courses. Selection within these courses, therefore, does not take place on the basis of intelligence, as much as is apparent in the Academic Course, but

seems to depend upon other factors, such as ability in hand work.

In conclusion one may state that the High School Academic Course adapts itself to students with intelligence above the average for those of their age. Moreover, selection within the course seems to be based upon the possession of general intelligence. On the other hand, while special courses, such as the Commercial, the Technical, the Industrial Arts, and the Dressmaking require general intelligence of an average and high average degree, selection within these courses does not seem to be based upon this factor alone. In general, it is apparent that High Schools are not adapting their courses to train students of a general intelligence below the average. Such a student has one chance in 150 to graduate from an Academic Course, but three times as many chances to graduate from a Technical Course and five times as many chances to graduate from a Commercial Course.

No attempt has been made in this survey to study all the different High School Courses, nor yet to claim that these findings will apply to schools in other communities. The purpose of this study was to discover whether or not group differences existed from a psychological point of view. It is apparent from the above results that such differences do exist and that some of these may be detected by the use of a group intelligence test. With such differences studied and measured, school authorities will find them of value in the educational and vocational guidance of the students who naively choose to take special High School courses.

THE TESTIMONIAL AS AN ADVERTISING APPEAL

By Egbert M. Turner, College of the City of New York

The purpose of this paper is to attempt to determine the value of the testimonial method of advertising from the viewpoint of the permanency of the testimonial writers' interest and belief in the worth of the article being advertised. The paper does not attempt to analyze the number of sales made by such appeals, but attempts to determine whether or not the writer of the testimonial:

1. Continues to believe in the worth of the article he first recommended.
2. Whether he bothers to answer the letters of those requesting advice.
3. Whether or not men and women differ with respect to the ways in which they as testimonial writers react toward letters written to them for advice.
4. Whether or not people with the medical degree differ from an unselected group in the way in which they as testimonial writers for an article of a medical nature react toward letters written to them for advice.

A business concern may, without decreasing its sales, spend thousands of dollars yearly for electrical signs which amuse and interest spectators, who often are unable to tell the name of the article being advertised a few minutes after enjoying the dazzling lights. However, a concern depending mainly upon the testimonial method of appeal cannot afford to invest money in printing and circulating these testimonials unless it is certain that these appeals are not actually interfering with and decreasing its possible sales.

Many advertising appeals do not lead to an immediate response, but require deliberation, comparison and choice. Professor H. L. Hollingworth (Advertising and Selling), calls such advertising appeals which bring into activity the higher thought processes, such as reasoning and decision, the "long circuit appeal." He calls those advertisements which lead to almost immediate response, because of their appeal to some fundamental interest, feeling or instinctive tendency, the "short circuit appeal."

Analysis of the method of advertising the article studied in this paper indicates that the appeal is a combination of the

short and long circuit appeals. The article being of a medical nature immediately appeals to those suffering the ailments it claims to cure. This short circuit appeal thus causes the observer of the testimonial pamphlet cover to read its contents. From this point on the short circuit appeal is overshadowed by the long circuit appeal, i. e., argument, reasoning and decision. If decision is not made, either to buy or not to buy, the reader often writes to one of the testimonial writers for advice,—thus protracting the appeal. Should the answer fail to come, or be unfavorable toward the article, the appeal is probably lost, and from the viewpoint of the concern a sale is lost,—hence the need of investigating the worth of the testimonial as an advertising appeal.

The business house for whom this study was made has 279 testimonials in eight different pamphlets. These pamphlets are sent to people whose names are secured in the usual mail order house method, and also to those inquiring directly about the article. Of the 279 testimonials 53 were written before the year 1916, 85 in the year 1916, 97 in the year 1917 and 44 during and since the year 1918.

In making this study the same type of letter was used in approaching the testimonial writers, stating that the writer had noted that he or she was an enthusiastic user of the article advertised and would appreciate their advice about it as he was contemplating the buying of it. A stamped envelope was enclosed in all of the letters, and "Mr." signed on all letters addressed to men and "Miss" on all letters to women. The reason for this precaution was that a sensitive person might object to write to one of the opposite sex about a medical article.

The replies and returned letters were classified as:

1. Good,—namely, all those replies recommending the article, and which might influence one to buy it.
2. Poor,—those which would cause one not to buy the article.
3. Returned,—all letters returned by Post Office as unable to locate.
4. No answer,—all letters which brought no response and were not returned.
5. Deceased,—letters returned advising that person addressed had deceased.

The limitations of this classification are evident. The replies classified as "Good" ranged in their advice all the way from a mere approval of the article to an enthusiastic "all

power" belief in it. Likewise, the letters classed as "Poor" ranged from a mere disapproval to a strong belief that the article was detrimental and dangerous to health. The letters were judged by four people,—the Medical Advisor to the Institution, the President, the General Manager and the Manager of the Mail Order Department. For the most part, their opinions were unanimous. Undoubtedly a ranking on the basis of 1 to 5 would have been more desirable, but it is extremely difficult to get business people to use and think in fine measures of gradation. Naturally those letters classified under "Good" were the only ones which could be considered as making a positive appeal, while those classified as "Returned," "No answer" and "Deceased" certainly did nothing to encourage the inquirer to buy, while those classified as "Poor" would tend to cause the inquirer not to buy.

The following table gives a statistical analysis of the returns for the 279 letters written:

TABLE 1

SUMMARY OF REPLIES AND RETURNED LETTERS.

	Men, Women & Institutions		Men		Women		Institutions		Men, Women and Institutions Before 1916		Year 1916		Year 1917		During & after 1918	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Good.....	138	49.4	90	47.9	46	56.1	2	22.2	17	32.1	39	45.9	56	57.7	26	59.1
Poor.....	19	6.7	9	4.8	8	9.8	2	22.2	6	11.3	5	5.9	6	6.2	2	4.5
Returned..	52	18.6	40	21.3	11	13.4	1	11.2	13	24.5	21	24.7	11	11.3	7	15.9
No answer.	55	19.7	35	18.6	16	19.5	4	44.4	13	24.5	15	17.6	19	19.6	8	18.2
Deceased.	15	5.6	14	7.4	1	1.2			4	7.6	5	5.9	5	5.2	1	2.3
Total	279		188		82		9		53		85		97		44	

It will be noted that only 49.4% of the replies were favorable; that is, about one-half of the letters written to the original testimonial writers elicited favorable replies. Of the replies, 6.7% were of the nature which would discourage the potential buyer. The remaining 43.9% of letters failed to bring forth a response and thus made no selling appeal whatever. If anything like these percentages hold good in other concerns the testimonial method of appeal is very wasteful since it favorably impresses only about one-half of the prospective buyers who have actually shown an interest in the article to the extent of writing for advice about it.

Furthermore, it will be noted that the more recently written testimonials are more effective than the older ones. Of those writing testimonials before the year 1916 only 32.1% replied favorably; of those writing during the year 1916, 45.9% replied favorably; of those writing during the year 1917, 57.7% replied favorably; during and since 1918, 59.1% replied favorably. The favorable responses for the different periods range from 32.1% to 59.1% This calls attention to the imperative need of continually revising testimonial pamphlets, but even the highest percent of 59.1 seems to the writer to be amazingly low.

To speak with certainty of this apparent wastefulness it would be necessary to compare the sales resulting from the testimonial appeal with the sales resulting from an appeal free of testimonials. This study might be conducted by sending two unselected groups two different forms of appeal. An analysis of the number of sales would then indicate the relative values of these two methods, and also whether or not the fact that from 40 to 68% of testimonial writers fail to respond to inquiries about the article they have recommended decreases the sales below the number made by the other appeal. It is believed by some that people prefer to write testimonial writers instead of the business concern, feeling that the advice will not be biased, and also that they escape the many follow-up letters sent by the usual mail order houses. Should the analysis indicate the value of the testimonial method it would then call attention to the need of devising a way of increasing the percentage of favorable replies.

It is of value to determine whether or not there are any characteristic differences between men and women with respect to the ways in which they behave as writers of testimonials. Of the 279 testimonials 188, or 67.4% were written by men; 82, or 29.4%, by women and 9, or 3.2%, by representatives of institutions. The concern claims that there was no conscious selection of men's testimonials, but that when the pamphlets were compiled the good testimonials were selected regardless of sex. It may be that women are somewhat more reserved than men about recommending an article of a medical nature. While the concern has no record of its sales according to sex still the general belief is that more men than women buy it.

It will be further noted that 47.9% of the men and 56.1% of the women answered the letter, requesting advice, favorably. That is, 8.2% more women answered the letter favorably than men. On the other hand, it will be noted that 4.8

of the men wrote unfavorable replies and 9.8 of the women wrote unfavorable replies. That is, 4% more women wrote unfavorable replies than men. While these differences are small still the indications are that a greater percent of women wrote both favorable and unfavorable replies than men.

Among the testimonial writers were a few doctors, but the number of men and women holding the medical degree is too small to permit any valuable generalization, still the table below shows indications that are worth considering:

TABLE 2

COMPARISON OF REPLIES FROM DOCTORS AND NON PROFESSIONALS

	Doctors		Non-Professionals	
Good	8	44.4	130	49.8
Poor	4	22.2	15	5.8
Returned	4	22.2	48	18.3
No Answer	2	11.2	53	20.3
Decreased			15	5.8
Total	18		261	

It will be noted that of the 18 doctors who first recommended the article only 44.4% wrote favorable replies to those requesting their advice, as compared with 49.8% of 261 people other than doctors, who answered favorably. Also that 22.2% of the unfavorable replies were made by doctors as opposed to 5.8% of the unfavorable replies written by others than doctors. This seems to indicate that from the viewpoint of a business concern those of the medical profession are less dependable as testimonial writers regarding articles of a medical nature.

CONCLUSIONS

1. Approximately an average of only about 50% of testimonial writers answer favorably in response to inquiries from prospective buyers of the article in question.
2. About 6 or 7% of testimonial writers give unfavorable and unsatisfactory replies in regard to an article they at first recommended.
3. Recent writers of testimonials are inclined to write more

favorable replies,—hence the need of frequently revising testimonial pamphlets.

4. The difference between men and women with respect to the ways in which they behave as writers of testimonials is small, but the indications are that women write a greater percentage of both favorable and unfavorable replies with reference to testimonials.

5. From viewpoint of a business concern, those of the medical profession are less dependable as testimonial writers relative to an article of a medical nature than unselected people.

EFFECT OF LETTERS AND SYLLABLES IN PUBLICITY

By Edward S. Jones, Oberlin College

It is patent from a casual notice of trade names and other symbols used in advertising that certain forms are much more desirable than others. Comment regarding the characteristics of letter and syllable forms in language go back at least to the rhetoric of Dionysius of Hallicarnassus who undertook to analyze the affective quality of various Greek letters. Unfortunately a study of this sort for one language does not carry over into other languages well, as many letters are pronounced somewhat differently in different tongues which may have derived their forms from the same roots.

Some one has suggested that the affective quality of articulated forms is closely related to, if not contingent upon, the affective quality of predominant tastes in that part of the mouth effecting the articulation. The harsher forms, for example, such as "g" involve the back of the tongue and consequently are connected with the sensation of bitterness assuming an unpleasant flavor. It is presumed that early in the language experience of the child, when the taste sensations are in relatively pure form, these affective conditions are started. Words denoting disgust, and the emotion of fear (including certain religious utterances) are cited as evidence.

Of course it is possible that other influences are much more potent in such affective tendencies (which are really conditioned reflexes) than the sensations of taste. This is specially probable in consideration of the recent agreement on the part of investigators that taste "localization" on the tongue is not nearly so definite as it was once thought to be. Letters involving extensive movements of the uvula or throat, such as "k," "g" and "q" are utilizing the same muscles which are active in sudden emotion, particularly despair. The sonants "b," "d," "g" and "v," which involve a vibrating larynx as well as throat movements may be specially correlated with sustained excitement. The "l," "r," and "s" forms seem to include front of mouth movements, and probably a tendency to widen the mouth, and may thus be correlated with the emotions of love,—hence engender pleasure. The

"s" form, however, is considered quite unpleasant by Dionysius on account of the accompanying hissing sound, which should remind us that auditory imagery must of course complicate any effort to correlate feeling quality with the articulation peculiar to language forms.

But this is all speculative. If a connection between our simple letter forms or syllables and affective states does exist, it should be subject to investigation. No doubt many authors have an unusual sensitivity for the "feeling" of forms in prose or poetry.[1] It is possible also that experienced advertisers are able to select symbols which are calculated to be not only pleasant but also easily remembered as compared to other forms. Such differences in *affective* and *memory* "value" in letters or syllables should be experimentally determined and objectively recorded to some extent at least, if they are worthy of our attention in matters of publicity.

The experiment to be recorded is a mere outline of what is experimentally feasible. Only 15 subjects were used, and for purposes of simplifying data, and to study special types of articulation, we confined the experiment to certain letters only, neglecting the vowel "i" for example. We used only nonsense syllables,—so far as possible those which had no sound or sight similarity to real situations. This type of stimulus has two advantages: it minimizes the significance of associations and early affective conditioned reflexes arising therefrom; and it also tends to approach a practical condition in advertising. Many trade-names are nonsense syllables or combinations of such syllables so far as the public is concerned. It is one way of making a symbol vivid and distinct (e. g. rit, tirro, hag, zet, loju, kef, pax, raz, vital, zim).

Our method was to make up a list of syllables, 50 in all, and present them in pairs to the subjects. Each syllable occurred twice, each time with a different mate, once the first of a pair and the other time the last. This presumed to eliminate differences due to position, and to compensate somewhat for the influences of specific syllables or sounds on others. A subject was asked to force a distinction between the two syllables shown, and to grade each differently on a scale of 3 points. That is, it was the paired associates method, allowing at the same time for some grading, so that if the two syllables were markedly different in affective quality, one might be graded "3" and the other "1." Each subject was asked to think of "3" as significantly pleasing and well liked; of "2" as above average in affective tone, at least not dis-

[1] Cf. Bliss Perry, "A Study of Poetry," 1920.

pleasing; and "1" as below average, or positively distasteful. A more extensive scale of measurement, say a five place system, might have been used to advantage, though it would require a longer time for decisions which might in turn have allowed for the development of further associations in the case of syllables used. After each judgment had been made, the subject was asked not only to indicate the number to be assigned to the right and left syllable, but also indicate after a number a plus sign if there was a pleasant association or meaning attached, and a minus sign if there was an unpleasant association. There were only three out of the fifty syllables used which seemed to call up associations for the majority of the group; although of course this method does not account for unconscious affective influences arising by the conditioned reflex route.

The second part of the experiment came ten days later, without the subjects' knowledge that they would be expected to remember the syllables they had seen. Each of the syllables had matched with it a confusing syllable, only one of the three original letters being altered. The one hundred syllables were presented to the subjects in random order, and the subjects were asked to indicate those of the group which they had seen before. They made a distinction also between those they were sure of and those they thought they had seen, but were less sure about.

The results are suggestive. Out of the 50 original syllables shown, the following—in the order from high to lower affective value—turned out to be distinctly pleasing to the subjects:

"Nep, lon, dur, paz, des, zef, tor, dos, reg, ros, ber, tur, tul, ket, tov,"

Those syllables most unfavorably considered for the 15 subjects, in order from medium to the least pleasurable forms were:

"Bod, seg, sev, kuv, tas, kaz, ruv, sab, rav, geb, vab, vud, ged, gur, gak."

On account of the large number of "neutral" syllables, of little difference in affective value, in between these lists, there is unquestionably more difference between "Nep" and "tov," or between "bod" and "gak," than between "tov" and "bod." The syllables in the medium affective range, in the order of more pleasing to less pleasing were:

"Dav, lof, teg, keb, bep, gof, sef, teb, lug, ret, mul, pev, sud, zud, reb, dap, kop, bov, sof, kut,"

An inspection of those syllables accompanied by associations leads one to feel that the matter of favorable or unfav-

orable associations was not very significant in fixing the order in the series of any syllable. For example, the form "dur" had 4 positive (favorable) associations out of the 30 chances (2 for each subject), and 2 negative associations. The form "lug" had 2 positive and 6 negative associations attached; while "sud" with the largest number of associations noted had 10 negative and 6 positive marks. The form "gof" which stands at about the middle of the series had 8 positive and no negative associations recorded against it, while the form "gak" which is far below all the others in its affective quality only had 7 negative associations noted. All the other forms had 5 or fewer positive and negative marks, out of a possible 30, indicating associations.

The following preliminary conclusions seem to me justifiable: Forms involving the letters "t," "d," "l" and "r" tend to be pleasurable. There is not enough evidence for "n" and many other forms. Forms involving "g" and "v," and to a less extent "k" and "s," tend to be unpleasurable. It is interesting that of the two labial occlusives, "p" and "b," the latter seems to stand less favorably, perhaps because it involves more palate movement.

The beginnings of such simple forms seem to be more indicative of the probable affective tone than the endings, or the vowel; i. e. there is more regularity between the presence of certain letters and the affective quality of the syllables as a whole, when we consider first letters.

A very important question that arises is:—do pleasing letter and syllable forms when put in combination always remain pleasing, and will the insertion of an unpleasant form necessarily tend to lessen the affective tone of a combination? Only a few random cases of the combinations of such syllables were tried; i. e. the presenting of a five or six letter form made up from these syllables. On the basis of the results obtained from a few subjects, it appears that the affective quality of a combination of two syllables can in general be predicted from the affective character of the components, but that the first of the two combinations is far more potent in determining the type of affective tone than the second. The forms "torav" and "desev," for example, ranked fairly high, though the final syllables of each were considered quite unfavorable,—as noted in the above lists. It is also possible that many combinations, whose components are separately disagreeable, may be of average affective value at least. This seemed to be true of the form "ravab."

The relationship between letters and syllables and *memory* value is not as close as in the case of the affective quality. As already indicated, the memory value of a syllable was gauged by the number of persons recognizing it, among other syllables specially intended to confuse, after a ten day interval of time. Syllables of highest memory value, beginning with the most easily recognized stand in this order:

"Bep, sud, sof, tov, reb, tul, ruv, sev, tas, bov, des, kuv, pev, paz, sef,"

Those standing lowest in memory value in the order from medium to the lowest are:

"Gof, lon, kut, dos, bod, teg, ros, mul, ket, kaz, keb, geb, ged, dav, vab."

Associations are of slightly more value in the case of recognition than in determining affective tone, the 6 women apparently benefitting more than the 9 men subjects in this respect. Seven out of 15 syllables standing highest in memory value were designated as having associations by one or more subjects, whereas only 4 of the 15 syllables lowest in memory value had associations.

It seems probable that syllables starting with "s" and "t" are favored as to memory value. This seems also true of "r" and "p" sounds. The endings in "v" are apparently specially high in memory value. It is interesting that all of these letters are distinctly 'front of mouth' forms, involving lips or tongue tip, though "v" is also a palate form. The letters "g" and "k," standing low in memory value, are distinctly 'back of mouth' forms. It is apparently not the amount of articulation in a form which determines its memory value as some authors have suggested.

There is perhaps also some connection between vowels and memory value. Of the seven syllables most readily recognized only two have "a" or "e" as vowels, whereas the lowest seven syllables all have "a" or "e" centers. However, except for the extremes, this relationship does not hold and it is therefore of doubtful importance.

Apparently there is little or no relationship between pleasure value and memory value in simple syllables. The correlation between these two factors measured objectively, as described above for the 50 syllables, is barely positive—less than .1. Those syllables with the highest memory value are apt to be mediocre or neutral in affective quality. Several syllables which were easily confused in later recognition were quite agreeable, e. g. "lon, dos, ros, ket, and dav." However there

is one serious source of error in considering the memory value of single syllables which should not be minimized; i. e. the difficulty of testing rigidly and comparably each of the 50 syllables used. It was obviously impossible to incorporate into the recognition test, of 100 syllables, 50 confusion syllables each equally different from one of the older 50 syllables which had been judged for affective value.

One additional point of interest was studied,—the relationship between the pleasure rating, and also the memory value, of the initial 50 syllables and the commonness of these syllables in the ordinary word forms of every day life. An abridged dictionary was referred to, and a notation made of the relative frequency of each of the syllables standing high and those standing low in affective value, and in memory value. There was no relation evident between the prevalence of syllables in our every day language and the memory value of these syllables. Of the ten nonsense syllables lowest in memory vaue, 4 were new or unfamiliar and 4 others were only slightly used; of the 10 syllables highest in memory value 3 were new and 4 only slightly used.

Probably more of a relation exists between the affective character of syllables and their frequency in language forms. Especially is it true that totally unfamiliar syllables tend to be disagreeable. Six out of 8 of the syllables lowest in memory value were practically unused syllables. It is quite possible that the fact that these syllables are unfamiliar does not cause their unpleasantness; on the contrary language usage may have "selected" for its permanent forms those syllables which were the most pleasing. Obviously, however, any disagreeable form repeated often enough will lose much of its unpleasantness.

In summary, it is evident that the affective and the memory value of different letter and syllable forms can be experimentally studied to the advantage of Applied Psychology. The results obtained from a preliminary experiment are in line with opinions occasionally expressed. Forms involving the liquids "l" and "r" tend to be pleasing. The dentals "t" and "d" are distinctly preferable to the harsher occlusives "g" and "k," and to the fricatives "v" and "s." Initial letters, or syllables, of a combination are specially significant in determining the affective status of that combination. Forms which necessitate lip and 'front of mouth' movements have the advantage in memory value. There is no simple relation between the pleasure value and the memory value of different

forms; but on the average the 'front of mouth' forms seem to have the advantage in both respects. The relative familiarity which we have with syllables in a language does not seem to affect their memory value, nor their affective tone to a significant extent; however, the most disagreeable syllables are apt to be unfamiliar.

Such a preliminary experiment can but point to future lines of investigation, detailed and objective. Some of the questions for possible research are as follows:

Are the above results confirmed with more extensive experimentation with many more combinations of letters and syllables, and when different methods are used to measure the affective and memory values?

What is the influence of repetition on the affective tone of syllables? May certain relatively neutral forms become quite pleasing?

Will the affective tone of a syllable, and possibly its memory value, differ markedly when we consider different articles for which it may be a symbol (e. g. automobiles vs. food stuffs)?

Are there emotional experiences other than simple affections which should be taken account of in favoring a letter or syllable form in considering publicity? i. e. may certain forms be more "solid," or more "elegant," than others regardless of their pleasure value?

SUBSEQUENT HISTORY OF E——; FIVE YEARS AFTER THE INITIAL REPORT

By LETA S. HOLLINGWORTH, CHARLOTTE G. GARRISON, and AGNES BURKE,
Teachers College, Columbia University

In THE JOURNAL OF APPLIED PSYCHOLOGY for 1917 a report was made of the mental status and educational achievement of a boy, E——, at that time 8 years old.[1] Reference to this initial report will show that at the time of first mental examination E—— showed an IQ of at least[2] 187 (Stanford-Binet), and that he was then doing superior work in the 6th grade of the Horace Mann School. In this school the median IQ of the pupils is about 116, and the median age for pupils in the 6th grade there is 11 to 12 years.

It is the purpose of this paper to give a brief account of the development of E—— five years after the initial report. Mental and physical measurements have again been made, and scholastic achievements have been ascertained, as follows. Additional facts, also, concerning E——'s genealogy are herewith presented. It is a question of good taste, and perhaps to some extent of ethics, as to whether an investigator may give the name of a living subject of scientific research. Since E—— has already become well known in the community where he resides, and since the facts as now set forth are undoubtedly sufficient to identify him, there seems no real point in omitting his name from this report. Permission has therefore been sought and granted for the use of E——'s name, which is Edward Rochie Hardy, Jr.

Additional data on Genealogy. In the initial report data were given concerning the parents of Edward. Fairly complete genealogical records of maternal ancestry are avail-

[1] Garrison, Burke, and Hollingworth, The Psychology of a Prodigious Child. *Journal of Applied Psychology*, 1917.

[2] "At least" because E—— on first examination passed some tests at the highest level afforded on the Stanford-Binet. Had still more difficult tasks been provided, he might have succeeded with some of them, though in the opinion of the examiner he probably would not have done so.

able.[3] [4] [5]. Five persons bearing the surname of the mother settled in New England before 1650. These were probably all related to each other. The individual who was Edward's direct ancestor first appeared in New England in 1639, and settled in Cambridge, Massachusetts. This family attained great distinction in the six generations recorded in the New England genealogy. A son of the first ancestor in America was a royal councillor, and the greatest merchant of his day in New England. A grandson was royal governor of Massachusetts, and later of New Jersey. He was also a patron of learning. A great-grandson was chief justice and lieutenant governor of Nova Scotia. A great-great-grandson was a royal councillor of Nova Scotia, some of whose children settled again in England, of whom a son was a distinguished naval officer, atttaining the rank of rear-admiral in the British navy.

These genealogical records, and other records of New England families which intermarried with this family, have not been brought up to date. The maternal surname appears first about 1176 in the records of England, and was apparently Norman-French in origin.

Mental Measurements. In the spring of 1920 Edward took the Thorndike Mental Tests for Freshmen, for entrance to Columbia College. An official letter from the Director of Admissions at Columbia College states that, "In the Freshmen Tests he (Edward) was number two, out of 483 entering Columbia College." Edward was then 12 years 0 months old, the median age of his competitors being about 18 years.

On September 29, 1921, Edward was examined mentally by Dr. Hollingworth, by means of Army Alpha, Form 5 and Form 6, for purposes of recording his mental development. On Alpha, Form 5, he made a score of 194 points, finishing several of the tests before the time limit, without error. On Form 6 of Alpha, which was taken subsequently on the same afternoon, his score was 201 points; and here too some of the tests were finished in about two-thirds of the time allowed, without error. As the method of scoring Alpha does not provide for a time bonus, this cannot be taken into account in the formal score.

[3] Bartlett, J. G., The Belcher Families in New England. N. E. Hist. and Gen. Reg., vol. 60, pp. 125-136, 243-256, 358-364.

[4] Belcher, Jonathan, The Belcher Papers. Coll. of the Mass. Hist. Soc., vol. 6 and vol. 7.

[5] Appleton's Cyclopedæia of American Biography, vol. I, 1887. (Jonathan Belcher.)

Physical Measurements. On September 29, 1921, measurements were taken of height, sitting height, and weight, as follows: ht.=64.2 inches, sitting ht.=31.7 inches, wt.=166 lbs., (with summer clothing). Health remains most excellent. This child has never had a serious illness of any kind.

Scholastic Achievement. In the spring of 1917, Edward finished the 6th, 7th, 8th and 9th grade work at the Horace Mann School. He was then just 9 years old. Thereafter he attended The Friend's Seminary, and graduated from the high school there in the spring of 1920, with an excellent record, and excess credits. He was then 11 years 10 months old.

By this time, also, Edward had passed the comprehensive examinations of the College Entrance Board for Harvard College, one of the present writers having seen the official communication from Harvard authorities, making statement to this effect. Edward's maternal ancestors had attended Harvard (one of them having graduated from there at the age of 18 years, according to the records), but Edward expressed a desire to attend Columbia, and received permission to take the mental tests with the applicants of 1920. He was admitted to Columbia College with the freshmen of 1920, with 14 points of advance credit toward a B.A. degree.

The present writers have at hand an official statement of this child's academic status on June 1, 1921, at the age of not quite 13 years. He had then 46 points of academic credit toward a B.A. degree in Columbia College. During his freshman year he made 32 points, maintaining consistently a grade of B, except in two subjects. In *physical education* his rating was C, and in *contemporary civilization* he made A the first semester. (It is worth saying that in *contemporary civilization* the final examination[6] had been objectively standardized by Mr. Ben D. Wood, expert in educational measurement, and did not depend on the estimate of instructors). These marks have the usual significance: A = excellent, B = good, C = fair, D = poor, F = failed.

Edward attended the Summer Session of 1921 at Columbia, making five credit points, all A grade, and is at this date, September, 1921, a sophomore in Columbia, with many points of credit in advance of minimum sophomore status. In addi-

[6] "Hardy's score on the objective examinations of both terms was in the highest tenth of the highest percentile." B. D. W. (The instructor's estimate, as well as the result of the objective examination, enters into the *term* grades recorded, and indicated above, in this course; so that the final grade in the second semester is but B.)

tion to having passed the comprehensive examinations for college entrance, he has passed the examinations in trigonometry, solid geometry, chemistry and physics. He is 13 years 3 months of age.

Extra-Curricular Activities. Edward was, of course, a conspicuous freshman, because of his extreme youth, and he was "hazed" by the sophomores for refusing to wear a prescribed necktie. One of the New York newspapers commented on his conduct under hazing as follows:

"He has demonstrated that he is, nevertheless, a regular fellow. He did it first by bringing about a conflict, in which he himself was the much-buffeted prize of battle, and then by glorying in his bruises instead of making them the basis of a grievance.

"He is a good sport, as well as a good scholar, and being both he ought to go far."

Edward also participated in the class play, given in 1921, humorously consenting to impersonate himself.

Manual work has no more charm for Edward than it had when he was 8 years old. That he *can* work with his hands and with materials when motivated is suggested by an incident connected with the liberty bond drive. His teacher relates that Edward wanted to pay for his own bond; so he made jelly, working at it till very good jelly was made, and sold it for the purpose specified.

In recent years there has developed a keen interest in detective stories.

Comments of Teachers. Comments from Edward's teachers during the last five years are indicative of their estimates: "The regular course of study has been so easy that he has, in several subjects, notably English and History, accomplished a great amount of voluntary work outside the course." "An excellent mixer with older students." "His weekly visits have been a pleasure and anticipation, and his ability to understand without English the spoken Latin and the authors as I have read them aloud to him, has been extraordinary." "Has done very remarkable work in science, particularly in theory." "I predict for him a great scholastic record in college." "I consider it a privilege to have had something to do with teaching him." "Possesses a *power* in Latin that few persons ten years his senior can boast." "Has shown devotion to the best interests of the school."

Summary. In the five years which have elapsed since Edward was first tested mentally, he has shown no tendency

to become mediocre. His gifts have not grown less. He maintains his superior status in mental tests. As for achievement, he has passed during this interval from the 6th grade of the elementary school, half through the second year of college. Average children, the country over, born when this child was born, and measuring 100 IQ when he measured 187 IQ, are now in the 7th grade of the elementary schools. Edward's development in the traits and achievements measured may be summarized as follows:

Born June 17, 1908. (According to official birth certificate, as seen by Dr. Hollingworth, and according to statement of mother, as received by present writers.)

	E.	*Norm
November 4, 1916.		
Height	54.3 inches	49.5 inches
Weight	89.3 lbs	54.2 lbs.
Intellectual	IQ 187	IQ 100
status	(Stanford-Binet)	(Stanford-Binet)
School	6th grade	*3rd grade
status	elementary school	elementary school
September 29, 1921.		
Height	64.2 inches	58.2 inches
Weight	166 lbs (light clothing)	89.5 lbs.
Intellectual	194 points	47 points
status	(Alpha, Form 5)	(Alpha)
School	4th semester	*8th grade
status	college	elementary school

It is an interesting theoretical question as to how far human intelligence may vary from the norm, in the direction of superiority. The case of this child has been placed on record largely because it seems probable that such cases represent very nearly the extreme possible limit of variation in the human species, as it now exists. At 8 years of age his IQ stood at +11 P.E., (1 P.E. being ±8 IQ, according to Terman's distribution). The probabilities are usually regarded as slight that cases beyond 5 P.E. will occur. Perhaps the range in human intellect is much greater than probabilities would lead us to guess.

Edward still wishes to be a minister, and go abroad as a missionary. To this end he interests himself especially in history, the languages, and anthropology.

* Note: Norms for height, weight and school status are taken from Bird T. Baldwin, as established on children from Horace Mann School, Francis Parker School, and the Elementary and High Schools of The University of Chicago, where the children are above average (for the population at large) in intelligence.

Since the initial report of this child's qualities, readers have occasionally asked with what meaning the word "prodigious" was used in reference to him. It was used in the dictionary sense of "wonderful," "extraordinary."

In these reports there is no intention to approve or to disapprove the educational regimen pursued. Who knows what should be the educational treatment of a child standing at +11 P.E. in intellect? The sole intention is to record facts concerning the identification and development of a deviation so extreme that the chances are theoretically almost nil that it would occur at all.

THE SIGNIFICANCE OF UNWILLINGNESS TO BE TESTED

By F. B. KNIGHT, State University of Iowa

As a pedagogical device in introducing the 'mental test' to the teachers of a county in Iowa, I had the teachers take Thorndike's College Entrance Examination, Part I. At the time of taking the test the teachers were given the choice of signing their names or not as each saw fit. They were assured that no administrative use of any kind would be made of the scores. The superintendent would not be informed of the relative success of any teacher. However, those teachers who signed their names to their tests would be told what scores they made and how their scores compared with scores made by college students, stenographers, soldiers, and the like.

There were 65 teachers in the group, 39 signed their names, 26 did not. The distributions of these two groups are as follows:

Score	Frequency of scores on signed papers	Frequency of scores on unsigned papers
35		1
40		
45		2
50	1	
55	1	3
60		1
65		2
70	2	2
75	1	3
80	3	4
85	4	
90	1	2
95	5	2
100	3	5
105	4	1
110	5	
115	2	1
120	3	
125		
130	1	
135	2	
140	1	

The average score of the signed papers was 100.
The average score of the unsigned papers was 75. Only

four of the 26 unsigned papers equalled or exceeded the average of the signed group. Only 5 of the 39 signed papers were as low or lower than the average of the unsigned tests. We have very definite contrast in performance between these two groups. Chance variations even with as small a group as this would be an unlikely explanation of the difference of the two distributions.

Although we have too few cases upon which to base a certain conclusion it is evident that unwillingness to sign one's name to a mental test may be an unconscious confession of probable inability to do well. Willingness or even desire to know how you compare with others is associated with relatively good scores. This explanation seems to me more reasonable than that unwillingness meant becoming modesty or willingness inordinate forwardness. Should not one's attitude toward a test be of definite diagnostic aid?

NOTES AND COMMENTS

Announcement of the Psychological Corporation is made in a recent number of *Science*.

In answer to the letter addressed last year to psychologists in regard to the plans for the corporation, 161 replies were received. These were all favorable with the exception of two letters from psychiatrists. There was general expression of appreciation of the importance of an organization that will maintain adequate standards in the applications of psychology and will use any profits there may be for psychological research.

The directors have authorized the establishment of branches whereever a director or three members of the American Psychological Association are ready to take an active interest in the work. We shall be glad to receive word from those to whom this memorandum is addressed in regard to the formation of a branch in their neighborhood.

The stock of the corporation is to be held by psychologists active in its work. The directors have authorized the sale of from one to three shares to competent psychologists. The stock will be sold for $10 a share and may be taken over by The Psychological Association at $100. The principal capital of the corporation is the ability and interest of those who take part in its work, and a psychologist who subscribes $10 for a share is expected to give time worth $90 before disposing of the stock, though only as a general understandng, the decision regarding which is left entirely to the holder of the stock. Those to whom the memorandum is addressed who want one share of the stock may send a check for $10 to the treasurer of the Psychological Corporation, and the stock will be forwarded. If they want one or two further shares application should be made and the shares will be allotted if available.

J. McKeen Cattell, *President.*

The Psychological Corporation,
2617 Grand Central Terminal,
New York City.
February 20, 1922.

Information Course on Science of Management and Applied Psychology.

From August 21 to August 26, 1922, an Information Course on the Science of Management and Applied Psychology will take place at the "Orga-Institut"—an Institution devoted to the Science of Management and Applied Psychology in Berlin.

This Course will include lectures in the lecture-hall of the Institution and practical exercises in the laboratory as well as inspection trips with descriptive lectures.

It is planned to visit the following Institutions: the Psychotechnical Laboratory of the United Berlin Street Car Companies (employment psychology and vestibule school), the Psychotechnical Laboratory of the Head Postmastery, the Laboratory for Industrial Psychology at the Technical High-School-Charlottenburg, the Psychotechnical Lab-

oratory of the Berlin Office of Labor, a number of Psychological laboratories of large Berlin industrial concerns, the Institute of Applied Psychology directed by Geheimen Sanitätsrat Dr. Moll (specially for pathological cases) as well as some other places if the time set suffices.

The languages spoken at the Institute are German, English and French.

Only a limited number of students will be admitted, in order to give every member of the course the utmost possible consideration and to enable him to get full insight into the problems to be dealt with.

As all applications will be considered according to the date of receipt, it is advisable to give notice of attendance at the earliest possible moment.

The fees are for:

Dutch, 75 Gulden
Swiss, 150 Francs
Danes, 150 Crowns
Swedes, 150 Crowns
Norwegians, 125 Crowns
Englishmen, 5 £
Americans, 25 Dollars
Italians, 400 Lire
Spain, 150 Pesetas

For other Nations fees will be in accordance with these rates.

BOOK REVIEWS

HARRY DEXTER KITSON. *The Mind of the Buyer, A Psychology of Selling.* New York, The Macmillan Company, 1921. Pp. x+211. Price, $1.50.

Not to treat of the technique of selling, but of certain psychological principles related to the mind of the buyer, such is the purpose of this book. Most of the illustrative material, so far as it bears directly on selling, has to do with advertising. The outline treats of the usual stages in the sale, with good analysis of the important topics: attention, interest, desire, confidence, decision and action. In addition, a final chapter on the stage of satisfaction brings in an emphasis which is one of the best things in the volume. The salesman, advertiser, and sales correspondent, for whom the book is written, will find it quite readable and brief. The author has a facility for catchy phrases which stands him in good stead. Occasionally the psychological terminology clings to the pages in spite of the author's attempt to escape it. Dwelling on images, for example, seems unnecessary.

The psychologist will be interested in Kitson's excellent use of the historical method in studying advertising in order to discover the drift of progress through the decades. That advertising has made progress by its hit or miss methods is well shown by his studies of the decrease in the use of superlatives, decrease in the use of all capitals for headlines, and analysis of the kind of information used in advertisements. One regrets that more concrete examples of his principles from the field of personal selling were not available to the author. The illustration of the method used by a canvasser to sell a cooking product to a housewife is good, but is somewhat lonesome. Since the book meets a popular demand, often uses figurative language admirably for this purpose, and is generally sound in its principles, the reviewer may perhaps be most useful in wishing that somebody would build a different kind of book based on a psychological analysis of a collection of methods used by successful salesmen and illustrated with details of the different methods.

J. B. MINER.

PATON. *Human Behavior*, in Its Relation to the Study of Educational, Social and Ethical Problems. New York, Charles Scribner's Sons, 1921, pp. 465. Price, $6.00.

To the student of applied psychology no work would be more welcome than one on human behavior which should open a broad highway into that complex and difficult subject. Such a highway is, however, too much to expect at the present time. The practical control of human behavior has been so long a major task of so large a part of mankind that all the easy portions of the field have long been familiar, while its deeper penetration has had to wait for the advance of knowledge in other fields, especially in those of biology and physiology, if indeed the means are even yet available for any great advance of a rigidly scientific sort. For this reason it is enough if Dr. Paton blazes us a trail; in fact, he himself refers to his work as an "introduction," and in his exposition finds himself often brought to a stand by the absence of necessary information not yet available.

The main thesis of the book is that the key to the complexities of adult human behavior is to be found in the simpler sorts of behavior appearing in the lower, and even lowest, animals, in the earliest stages of human life (including the prenatal) and in the disordered processes of mental and nervous disease. The study of behavior involves the study of the responses of the total organism to the total environment. One must go not only back of the brain and spinal cord to the autonomic nervous system, but back of that to the endocrine glands, the muscles, the vegetative system and even to the most rudimentary adaptations of living matter; and above all one must not separate the mental from the physical.

The first of Dr. Paton's fourteen chapters traces the historical development of this biological-physiological point of view. The next eight discuss behavior (and personality, its unified expression) in its dependence upon the bodily mechanisms of adjustment and control, upon "trends" in activity and upon habit-formation. The next two deal with the typical problems of degeneration in old age and of the imperfect organization of personality appearing in conflicts and dissociations; chapter twelve with the method to be used in studying personality; chapter thirteen with education; and chapter fourteen with the more general sociological and international results that may be expected to follow from the study of the causes of human action.

To the general reader the chapter on Education will perhaps prove most interesting and can hardly fail to win the hearty approval of any who know what current education in the home and schools actually is and what it might be, but those who have occasion to use the book as a whole will regret that Dr. Paton has not employed more uniformly the direct and luminous style of which he shows himself occasionally to be the master and that he has chosen to present so large a part of his material in so abstract a manner. A few detailed cases would have been both more interesting and more illuminating.

EDMUND C. SANFORD.

Developing Mental Power. By STRATTON, GEORGE M. Boston, Houghton Mifflin, 1922. 77p. $.80.

Appearing as one of the Riverside Educational Monographs this book is patently a book on Educational Psychology for teachers, treating of the questions, what is mind, and how shall it be trained?

The opposing views of extreme faculty psychology and extreme particularization of function are presented, though naturally the supporting arguments of each could not be very largely developed within the compass of seventy-seven small pages. The educational implications of each view are treated by means of reviews of the discussions centering around transfer of training. The conclusion is reached that certain habits can be generated through school discipline, habits of giving "controlled attention to the task in hand; energetic attack upon it; accuracy in interpreting, remembering and reporting what is seen or read or heard; the power to distinguish important and unimportant. These are part of intellectual training; these and other things take the place of the few faculties of the older belief." Some of the other things are, emotional and volitional control which the author gives an important place in the educational process, even going so far as to suggest exercises in "will training" which the teacher can give the child: "Parents and teachers might well invent and assign things to be done, rewarding in themselves, and chosen, perhaps, from cooking,

drawing, modeling, painting, acting, reading, or any other of a hundred things—but now used in order to make habitual the right ways of purpose, applicable in any work. These right ways might here be set down, with another purpose than was guiding us earlier in this section, as: (a) suitable forethought; (b) speed and energy of attack, once the decision is made; (c) perseverance in what is undertaken; (d) economy of action, elimination of waste effort, "form"; (e) excellence of result in the product; (f) restoration of order when the work is done, putting away of tools and materials, clearing and cleaning up. Each of these six phases of the process should receive due attention,—perhaps one at a time, as Benjamin Franklin practiced the virtues,—but recurring and with different degrees of difficulty. There should be brief explanation before and after the fact, that the *idea* of what is sought should come with the practice, and should help to make the practice itself more fruitful and ready to reappear spontaneously in new places. And whatever is approved elsewhere as a means to interest and progress might be used here; if "marks," rewards, praise, or rivalries are good to spur on in numbering or writing or any other study this present learning to will aright is as worthy of their incentive.

As an exercise in suitable fore thought, the following might serve as a door to something better. There is, let us say, but ten minutes left, and the child must choose between cutting some design in paper and making candy; and the choice is then appraised, with explanation, according as the child has stopped to think, to look ahead, before deciding. Or, again, having at hand only some modeling wax, a pair of scissors and some very narrow strips of thin colored paper, one must decide whether to build a paper house or make the figure of a dog. Or still again, the child, without actual materials at hand and with the use only of his imagination, must say—with no change of vote permitted—which line of conduct is suitable, either in cases like those just given, or where some one of a thousand other situations is described—where, perhaps, a child has visiting playmates who have come walking from afar and up a long steep hill; shall they at first play "authors" or play "tag"?

Other evidences that the author has not been able entirely to avoid the extravagances incidental to popular psychologizing are such sentences as: "Steadiness [of will] not only has ten times the effect of violence, it is ten times more readily attained."

Nevertheless the monograph presents some considerations that may be new and instructive to young teachers even in these days when nearly everyone who goes to normal school takes a course in elementary or educational psychology, and by its stress upon the need of experimental verification of educational practices it should perform a service, to teachers, to psychology and to education. H. D. KITSON.

Psychotechnik und Taylor—System. K. A. TRAMM. Berlin, 1921, mit 89 abbildungen, VII, # 139.

Critics of the Taylor System have pointed out time and again that it has overemphasized the mechanical aspects of work at the expense of the human aspects. We know that it was certainly not Taylor's intention to do this, but that he was hampered in his approach to the problems of human behavior by the lack of an adequate technique.

Most of his followers were even less well equipped in this respect than he, and consequently, the subsequent development of Taylor's system was increasingly lop-sided. We have, as a result, the technique

of time-study and task setting which not only gives inadequate consideration to the human aspect of work but which is full of fallacies from a statistical point of view. Notable exceptions to this tendency are the Gilbreths and Robert Wolf. The latter called attention to the beneficial effects of giving to individuals graphic information about the progress of their work. The former attacked the more fundamental and comprehensive problem of developing the best possible methods of doing work by studying tasks in terms of the activities of the worker by which they must be carried out. Various methods were used to accomplish this, the best known being the photographic motion study.

In this country, the fundamental soundness of the ideas underlying the Gilbreth technique has been ignored because of its mechanical intricacies, so that the Gilbreths are today somewhat outside the pale of the more orthodox followers of Taylor. On the other hand, on the continent, and particularly in Germany, where the Taylor system has at least as great a vogue as in this country, Frank Gilbreth is regarded as its foremost exponent. And consequently, the development of the Taylor system there has been, at almost every point, influenced by Gilbreth's emphasis upon the study of human behavior and human capacities. The extensive literature on scientific management which the Germans have developed is an eloquent testimony of this influence, for it is difficult for any one to pick up anything on the subject of Taylor without finding reference to Gilbreth or accounts of his work either there or in this country. And the extensive work which the Germans themselves have done has definitely taken the direction of a study of the problems surrounding the performance of industrial tasks.

This is particularly true of the German psychologist. Whereas in this country, psychologists have given little or no consideration to Gilbreth's work, even though his technique is the ideal embodiment of the behavioristic point of view, in Germany it has been the stepping stone by which they have transplanted their methods directly into industry. And consequently, while applied psychologists in this country have been dabbling with the fringes of industry, German psychologists have stepped directly into its heart.

With this introduction, the significance of Tramm's title "Psychotechnik und Taylor System," as well as the contents of the book, can be more readily understood. Tramm is one of a group of industrial engineers and psychologists among whom are W. Moede, G. Schlesinger, A. Wallichs, S. Sinner, Alex. Schackwitz, E. Mickel, C. Piorkowski, who have been active in this field. Tramm begins with an outline of the general factors which apply to all work, such as physical environment, work periods, living conditions and habits of life, individual and team work, supervision, and the elements into which all these factors are subdivided. He discusses them merely in order to indicate their importance, without any attempt to show how they are to be controlled. Most of his book is devoted to the discussion of experiments and methods calculated to show how particular occupations can best be arranged with reference to the worker. For example, a study of about one hundred tram motor-car men under experimentally controlled conditions resulted in a modification of the handles of the three levers which they were required to use and also in a standard method by which these levers could be manipulated to the best advantage. Throughout the book, emphasis is placed not only on the details or steps by which an occupation can be best performed,

but upon the construction of the tools and apparatus peculiar to it as well. The description of the laboratory devices for measuring the performance of individuals brings out vividly the contrast between the German approach and that of the followers of Taylor in this country. Instead of the lonely stop watch from which time is recorded only by a fallible observer, Tramm describes in addition a half dozen other devices of varying degrees of refinement, devices which record operations graphically and which can be adapted to a wide range of occupations. Gilbreth's motion study technique is also fully discussed, though without any explicit reference to its originator.

The effects of practice are investigated with special reference to the process of training workers. And one of the outstanding features of the book is the presentation of a pictorial technique for instruction purposes. The study of fatigue is probably the most unsatisfactory section of the book, a fact which can be readily understood when we know the nebulous stage in which the fatigue problem rests today.

The psychologist will undoubtedly find much to criticize in this book. Its experiments are not presented with sufficient facts or data to enable him to estimate the value of their results. There is a too ready acceptance of some of the traditional and worn out concepts of psychology. Inferences are drawn which are often unwarranted by the facts. And the academic or superficial point of view is still very noticeable. Industrial engineers on the other hand may well question the practicability of the technique and the value of some of the results. Nevertheless, the book as a whole is an admirable attempt to visualize the problems of production, not only in relation to output but in relation to human capacities and abilities as well. As such it is an excellent critique of Taylorism as it exists in this country and should be of considerable suggestive value to psychologists, industrial engineers, and others who are interested in industrial practices. HENRY C. LINK.

NEW BOOKS RECEIVED

Books for review should be sent to W. F. Book Department of Psychology, Indiana University, Bloomington, Ind.

FREDERIC PIERCE. *Our Unconscious Mind and How to Use It.* E. P. Dutton and Co., New York, 1922. 323 pp. Price, $3.00.

ARTHUR S. OTIS. *Otis Self-Administering Tests of Mental Ability: Higher Examination.* World Book Company, New York, 1922. (Form A and Form B; price per package of 25 examination booklets, $1.00.)

Though the manual for administering this test is still in mimeograph form the tests are ready for use and the mimeographed sheet of directions contains all instructions for the successful use of the examination.

The publishers announce that the Higher Examination will be followed by an Intermediate Examination for grades four to eight. There will then be available self-administering tests for use in testing any literate person.

J. L. STENQUIST. *Stenquist Mechanical Aptitude Tests.* World Book Co., New York, 1922. Test 1, Pictures of common mechanical objects. Test 2, In part similar to test 1 and with questions relating to machines. Price per package of 25 examination booklets (either test) including one key and one record sheet, $1.50.

Manual of directions, 21 pp., contains instructions for giving, scoring and interpreting results and norms for each test. Price, $.20.

—— ——. *The Reorganization of Mathematics in Secondary Education.* U. S. Bureau of Education, Bulletin, 1921, No. 32, Washington, D. C. 73 pp.

—— ——. *Summary of Conclusions and Recommendations from a Survey of the Public Schools of Elizabeth City, N. C.* Department of the Interior, Bulletin No. 26, 1921, Washington, D. C. 43 pp.

—— ——. *Salaries of Administrative Officers and Their Assistants in School Systems of Cities of 25,000 Inhabitants or More.* Department of the Interior, Bulletin No. 30, 1921, Washington, D. C. 38 pp.

HENRY S. CURTIS. *School Grounds and Play.* Department of the Interior, Bulletin No. 45, 1921, Washington, D. C. 31 pp.

EDGAR DAWSON. *Preparation of Teachers of the Social Studies for the Secondary Schools.* Department of the Interior, Bulletin No. 3, 1922, Washington, D. C. 24 pp.

HERMILIO VALDIZAN Y HONORIO F. DELGADO. *Revista de Psiquiatria y Disciplinas Conexas.* Publicacion Trimestral. Lima, Peru, C. F. Southwell, 1921, Vol. IV, No. 1. 72 pp.

—— ——. *Record of Current Educational Publications.* Department of the Interior, Bulletin No. 52, 1921, Washington, D. C. 32 pp.

—— ——. *Tijdschrift Van Den Nederlandschen Werkloosheids-Raad.* Bureau: Singel 530, Amsterdam. Vol. 5, No. 2, 1922.

MYERS, CAROLINE E. and GARRY, C. *Measuring Minds.* An Examiner's Manual to Accompany the Myers Mental Measure. Newson and Co., New York and Chicago, 1921.

MCCALL, WILLIAM A. *How to Measure in Education.* The Macmillan Company, New York, 1922.